



FRIDAY, JULY 3.

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Contributions.

Canadian Pacific Maintenance of Way.

TO THE EDITOR OF THE RAILROAD GAZETTE:

The letter of "Argus" in your issue of June 19 appears to deal correctly with the Canadian Pacific maintenance expenditures of 1890, printed report. If "Argus" will turn to schedules B and C he will observe that they embrace an expenditure of \$2,701,506 for additions and improvements, which, added to \$2,009,658 for maintenance of way and structures, gives a total outlay of \$4,711,164. What a handsome sum is this to have the dividing up of between revenue and capital! At page 25 the Canadian Pacific shows the cost of maintenance per train mile as 16 cents. The Grand Trunk report for the same year shows 15½ cents; thus the Canadian Pacific maintenance at \$372 per mile for 1890 and the Grand Trunk maintenance of \$756 for the same period shows the latter road to have carried at less cost per train mile, with a maintenance of way more than double.

But it must be evident to all practical railroad men that no railroad such as the Canadian Pacific can be maintained for a series of years at so low a rate per mile as that given by that company. It is only when large capital accounts are closed that corporations have to come down to "hard pan," and, by putting their outlay into one account, show up facts as they are. Rely upon it, "Argus," that able men, as no doubt they are, after closing their capital account would give a very different showing; and it has to come to this some day.

OBSERVER.

Tunnel Ventilation.

TO THE EDITOR OF THE RAILROAD GAZETTE:

The interest shown in the ventilation of the Fourth Avenue tunnel leads me to speak of some observations, rather limited I must confess, of ventilation in the Bergen tunnel on the Erie.

On occasions when the wind, atmospheric and other conditions were favorable, I have, from one end of the tunnel, seen a man walk across the other end. Such a condition is rare enough, but evidently not impossible.

Standing at the rear end of a train I have frequently seen the tunnel remain clear behind the train, only small masses of steam from the engine getting behind the train whenever a shaft was passed, which would seem to show that the train carried with it, its own products of combustion, except where an unusual space over the cars allowed them to reach the back.

The above occurred when the train was alone in the tunnel. If two trains meet in the tunnel the conditions are at once changed; immediately after passing, an eddy sets in behind each train and the tunnel at once becomes "dense." Each train seems to draw in behind it all the cloud that would otherwise have been carried along by the other.

If this be true, the remedy seems simple. Erect a partition that would divide the tunnel into two tunnels. It would probably not be necessary to even divide the shafts. Such a partition would probably cost about \$5,000, which would not be much if it accomplished the desired result.

CHAS. J. BATES.

Phenomenal Friction.

BERLIN, June 5, 1891.

TO THE EDITOR OF THE RAILROAD GAZETTE:

SIR: In your issue of May 8th you published on page 321 an article of John H. Cooper, describing the case with which an axle-box could be made to slide longitudinally upon the axle when same was in motion. This phenomenon of friction is there said to have proved a marvel to all who witnessed it, as nobody could offer an explanation of it. I am astonished to read this, the observation not being new at all, and treated at least

in German handbooks of mechanics as a quite common thing. Too, there is no difficulty to give a very simple explanation. Let  $P$  mean the normal pressure of two bodies in contact and  $f$  the coefficient of friction, then relative motion begins as soon as a force is applied which exceeds  $Pf$  by the least quantity, the direction of sliding always being the same as the line of force, and *vice versa*. In the case of a turning axle the force  $Pf$  is originated by the motor of the testing machine and diverted along the circumference of the axle. This force, combined with a longitudinal pull  $Q$  of any smallness will give a resultant  $R$  exceeding  $Pf$  and deviating slightly from its direction, whereby the line of relative motion is shifted in the same way. This motion is easily understood to be of a screwing kind, the one component of which is performed by the revolving axle, while the other one is done by the axle-box sliding longitudinally.



We make the most common use of these facts when opening a bottle.

It is easier to turn the stopper than to draw it; hence the well-known screwing motion.

DR. H. ZIMMERMANN.

[Dr. Coleman Sellers did this matter up so thoroughly in our issue of May 15 that it has not seemed necessary to say anything more about it.—EDITOR.]

The Reno Tunnel.

TO THE EDITOR OF THE RAILROAD GAZETTE:

In your issue of June 26 you publish a note from Mr. J. W. Reno in which he attempts a defense for his system of tunnel for Broadway, chiefly by reiterating the statements contained in the original description of the plan as given in your columns.

Mr. Reno has probably hit upon the correct explanation of the tendency of advancing shields to revolve, but his deduction that a rectangular shield would not be subject to the same influences as a circular shield is not logical. The causes which he mentions would affect equally shields of all sections directly in proportion to the surface area of the heading, and the only advantage which a rectangular shield would have over a circular one would be in a greater resistance to revolving motion; but there is no reason to suppose that this resistance would be sufficient to maintain the shield in an upright position, and, as already stated, any departure from the perpendicular would be fatal to the stability of his tunnel.

It must be evident to any careful observer that the "system of horizontal and vertical bracing," on which Mr. Reno relies, is incompetent to resist the diagonal strains to which the tunnel must be subjected in case the shield revolves during construction or any unequal settling takes place afterward.

It was stated that this tunnel could not possibly stand without foundations, and Mr. Reno seeks to refute this statement by citing the cases of tunnels driven through soft materials in the past 50 years. Here he touches the key-note to the situation. In all the previous works of this nature a circular section has been adopted at a great sacrifice of available space, simply to avoid the necessity for foundations by providing a continuous and self-sustaining arch. With a circular section it makes no difference what changes take place in the bed of the tunnel, since the tube is free to adapt itself to such alterations without incurring any weakness for want of proper bracing. But with the rectangular section braced horizontally and vertically only, a slight settlement on one side at once gives the tunnel a diamond shape, and as one angle becomes obtuse and the other acute, the weakness increases, and it is only a question of time when the structure will be folded up like a Jacob's ladder.

SLOW AND SURE.

American and English Railroading.

TO THE EDITOR OF THE RAILROAD GAZETTE:

Whether or not Col. Jeffers induces his adopted country to give up the use of waggons and carry their freight on cars, both he and Mr. Dorsey have afforded their new countrymen occasion for considerable repetition of the Ephesian cry, which was probably not new 1,900 years ago; for England strives to live by exporting cars and locomotives, among other things, and her trade instincts are too strong to allow the adoption of any distinctively American contrivance, the sale of which from this country might come into competition with the sale of her own commodities.

The salient points in this discussion may, it seems to me, be stated as follows: Until about 25 years ago our freight rates were undoubtedly higher than those of England, our trunk-line rates, according to Poor, having been 2.9 cents per ton mile in 1865, and by the same authority the rates on the same roads for 1889 were 0.7 cent, and on all of our roads the rate for the last-mentioned year averaged 0.976 cent; "whereas, in the United Kingdom any reductions that have occurred in these directions during the same interval have been immaterial" (Jeans' "Railway Problems," p. 56). At the commencement of this period we were the third manufacturing nation and England was the first. Now we are the first, by a large majority, and England is the second.

She will be the third in two decades if she does not reduce her freight rates.

As a competing nation we can, it seems, regard the English practice with resignation, but some of the British authorities do not; e. g., in the *Edinburgh Review* of April, 1887, a writer says: "If our manufacturers commanded the same position in the markets of the world that they held 40 years ago they would have no time to squabble for a shilling or two a ton more or less for transport." And at the Society of Arts Canal Conference General Rundell, of the Royal Engineers, thought that so long as our "neighbours shut their eyes to the benefits of reciprocity in fiscal arrangements the only opening in which there seems to be a possibility of, at all events, diminishing the odds against ourselves is in an endeavour to reduce the cost of transport, both of the raw material and of the finished product." There is no parasitic growth in the world of so malign an influence as these high freight charges which your correspondent "Englishman" accepts with such complacency. And these high charges seem to be inherent to all railroads controlled by Englishmen, excepting always fourth-class fares in Hindoostan.

Possibly that degree of intelligence "in our midst" which has its ultimate beliefs furnished to it by what the Emperor William calls "hunger candidates," in our daily and non-technical press, may yet come to speak of the obstructive English methods of railroading with admiration, as they now know that the high tariffs under which we have reduced freight charges to about one-third of English rates, "cannot be good for America," but Col. Jeffers, who is understood to be an auburn-haired Vermonter, is not built that way. He is crying aloud in the marketplace, calling a spade a spade, and getting the people to hear him. The first break in English freight rates for 38 years is more apt to be due to him than to futile efforts by the associated Boards of Commerce for legislation.

Won't lower freight rates in England interfere with our relative progress in manufacturing? No. When they get here, we shall be so far ahead that their start will not be noticed.

AMERICAN.

The Norwood Junction Bridge Failure.

LONDON, June 18, 1891.

TO THE EDITOR OF THE RAILROAD GAZETTE:

The official report on this accident is out, and, to use the words of a London daily, "it is not pleasant reading either for the London & Brighton Railway or for its customers."

There are six very awkward facts concerning this accident which go far to confirm the opinion heretofore expressed in your columns regarding the general inferiority in so many respects of all the English lines which lie south of the Thames. These facts are, apart from the girder being of cast iron and unsound,

1st. Even if sound, the nominal strength was less than it should have been for the present engine loads, by some 16 per cent., says Major-Gen. Hutchinson.

2d. Two identical girders in this bridge failed in 1876.

3d. The Board of Trade then recommended the girders to be strengthened.

4th. No attention was given to the recommendation.

5th. No steps were taken by the Board of Trade because this inattention to their recommendation.

6th. There are still five cast-iron bridges on the main line of this company and others on branch lines.

These six points demand very serious consideration, and Gen. Hutchinson hopes there will be no unnecessary loss of time in replacing all cast-iron girders in under bridges, especially such as are so far below the dimensions nominally required for present weights of locomotives.

To the traveling public the most unpleasant fact is, of course, the entire neglect of the Board of Trade to enforce its own recommendations in a case where failure had already pointed out a weak spot and so far foretold an accident. This is not calculated to add much to public confidence in the working of the Board of Trade Railway Department.

It would appear that the two girders which failed in 1876 were broken by the derailment of an engine. Attention is also drawn to the fact that since 1883 the use of cast iron for under bridges has been prohibited on all new lines except when disposed as arches.

A grosser neglect of an obvious duty has hardly ever been brought home to an English railway company than this shameful and continually increasing overloading of a structure actually proved to have been weak by actual failure, wanting in the ordinary accepted margin of structural strength, and of a material long known to be untrustworthy for such a structure in such a form—that of the straight girder.

A bridge 31 years of age, even if in no way weakened by corrosion, was scarcely likely in the days of less distrust of cast iron, to have been so very seriously over-proportioned for the engine loads of the day as to warrant its continued use under loads of nearly double the nominal static effect, and perhaps several times the frequency of application.

It is generally understood among engineers that the scientific proportioning of English bridges has been much retarded by certain hard and fast rules of the Board of Trade, good no doubt when first promulgated, but continued long after the progress of knowledge in the properties of iron and steel and the effect of loads



static and dynamic, had been shown to require revision. Similarly the interference of the Marine Department of the Board with land boiler explosions has not been productive of any high public opinion of the capacity of the officials thereof, and some of the reports on explosions have been painfully empty reading.

The Norwood accident, revealing as it does the extremely perfunctory nature of the Board of Trade reports and the vigilance (?) of its officials in so glaring an instance, is calling out severe comment.

C. E.

[There are several facts about this accident which appear in the report of Major-General Hutchinson which our correspondent does not mention. Special mention is made of the fact that the train was running at a speed of probably at least 40 miles an hour, and was stopped in its own length, or 190 yds. It was equipped with the Westinghouse automatic brake and the engine driver applied the brake when he felt the shock.

The span of the bridge was 25 ft. on the square, and 26 3/4 ft. on the skew, carrying 7 tracks. The longitudinal girders are each 30 ft. long and 27 in. deep, the bottom flanges 20 in. wide, the thickness of the web and bottom flange 1 1/2 to 1 3/4 in. The rails are carried on cross girders and each cast-iron longitudinal girder has 10 sockets to receive the ends of these cross girders. It was one of the longitudinal girders which failed. It broke into three principal pieces, one 13 3/4 ft. long, one 11 1/4 ft. and one 4 1/4 ft. The surface of the fracture showed plainly the existence of an original flaw in the casting, extending in the form of the letter L from a point in the web about 7 in. above the bottom of the bottom flange to within about 1/2 in. of the bottom of this flange and then turning along the flange toward its outer end for the length of about 5 in. The flaw would average about 1 in. in breadth and 1/2 in. in depth. The length was about 10 in. The flaw was invisible when the girder was in sight, but it had extended to the surface of the web, where it was covered by a thin sheet of wrought iron used in the operation of casting the girder. The calculated breaking weight of the girder was about 71 tons; the flaw reduced this to about 53 tons. To sustain the engine under which it broke it should, by the rules of the Board of Trade, have been calculated to endure a breaking weight of 83 tons.—EDITOR.]

#### Cast-Iron Bridge Girders.

BY AN OCCASIONAL CORRESPONDENT.

The report in an English technical paper upon the failure of a cast-iron girder on the London, Brighton & South Coast Railway, near London, and your contemporary's remarks on the same, are very liable to lead to misconception as to the practice on this side unless further comment be published.

In Fairbairn's "Researches on the Application of Iron to Buildings," published in 1854 (or 36 years ago), the dangers of cast iron are pointed out. Up to that time a very large number of cast-iron bridges of short span had been constructed, though it must not be overlooked that many of these had the material disposed in the form of the arch, Fairbairn refers especially to "the main beams in the railroad bridge crossing Water street, Manchester." He calculated what weight laid on the middle of one beam "would be required to break it supposing it cast erect and of the same iron as we have used in the experiments, the dimensions from the model now constructing by Messrs. Fairbairn & Lillie being as follows:

Distance between supports, 26 ft., or 312 in.; depth in middle, 27 1/2 in.; area of section of bottom rib in middle, 16 x 3 = 48 in.; the breaking weight is found as 246,400 lbs. (110 tons)."

There were, I believe, four beams, one under each rail, and the bridge was built in the very early days of railroads, and was standing two years ago, and may still be in use. Fairbairn gives a sketch of the middle section, as below. Only the under side of the lower flanges was visible from the street below, and the beams were supported by classic pillars of stone, which stood between the street and sidewalk, so as to keep the span as small as possible.

The cross-section is singularly like that of the shorter beams of the collapsed Norwood Bridge, but they had at least the merit of symmetry.

Fairbairn speaks of cast-iron beams as much as 76 ft. span in one casting made for an Amsterdam firm and placed somewhere on the Haarlem Railroad, and he proceeds to call for special care in the design and founding of cast-iron girders, and refers to a serious accident in a cotton mill in 1844 to strengthen his appeal for good design, and finally anticipates the supersession of cast-iron beams altogether by wrought iron, and in later editions extends his work to wrought iron very fully, especially in regard to the system of cellular construction, in which he had experimented years before, in 1845, on account of the Britannia Bridge.

The fact that a cast-iron girder has stood for forty or fifty years is thus no argument for its continuance, even on a long past authority, when railroad loads and speeds were less, and it is a most dangerous economy in rail-

road managers to continue in service such as survive to come every year nearer the point of loading which will make plain their undiscoverable "latent faults." It is well enough known that the Norwood accident only narrowly missed being big enough to incur compensatory charges enough to renew a good number of cast-iron bridges.

In any case the dangerous nature of the material is sufficiently well known and proved to make it very difficult for any railroad persisting in its employment to shirk responsibility for any disaster arising therefrom. Indeed, it is only two or three years since an overbridge, carrying a wagon road over the Midland Railway at Charlton, near Manchester, collapsed and narrowly missed causing the wreck of a train on the line below. The failure was, of a cast-iron girder, and the worst was that the structure was quite a new one, along with many other bridges of like type. The practice is quite unwarrantable in every sense; the weight of cast iron necessary for even nominal sufficiency being so much greater than that of a wrought-iron girder, which, if of any fair quality, will buckle and deflect long before it fails.

LONDON, June 9.

#### The Prince Edward Island Tunnel.

The greatest public work the Canadian Government has now in contemplation is the construction of a railroad tunnel under the Straits of Northumberland, connecting the shores of New Brunswick with those of Prince Edward Island. At the request of the Dominion Government Sir Douglas Fox has made a report on the cost and feasibility of the work, of which the following is a brief summary:

The greatest depth of water is 96 ft. at high water, with a rise of tides of 6 ft. at springs and 3 ft. at neaps, and the speed of the current does not exceed three knots, with two hours of slack water at each tide. The distance from shore to shore is given at about 13,200 yds., or say from shaft to shaft 13,500 yds., exclusive of the land approaches on either side, of which about 2,000 yards would be in the tunnel. The shores on either coast are well adapted for railroad approaches, varying from 15 to 35 ft. in height above high-water mark, with a mean altitude of 25 ft., the soil being largely red clay. The higher land on the Prince Edward Island shore falls away toward the interior, which will shorten the approach on that side. It is considered that about 5 1/2 miles of railroad, including some 2,000 yards of tunnel as before mentioned, will be necessary beyond the shafts to connect the tunnel with the respective systems of railroad which, however, are of a different gauge, viz.: 4 ft. 8 1/2 in. in New Brunswick and the Dominion generally, and 3 ft. 6 in. in Prince Edward Island.

From the above it will be seen that the length of tunnel from shaft to shaft would be 7.67 miles, while with the connections to the present railroad on each side the whole tunneling required would be over 9 miles.

The estimates are as follows:

In the dry portions of the work, a tunnel of brickwork, in cement, averaging 1 ft. 6 in. in thickness (the bricks being of local manufacture), and where feeders occur, with cast-iron casing 1 1/4 in. in thickness with 6-in. flanges, laid with steel rails weighing 50 lbs. to the yard, is estimated to cost £266 10s. nearly, per lineal yard, or say £297,500 from shaft to shaft, or with the land tunnel and contingencies a total sum of £1,075,200.

Should it be decided that the tunnel must be of sufficient dimensions for a railroad of the 4.8 1/2 gauge, and that the railroads of the island shall be altered to that gauge, a tunnel of 16 ft. in diameter would appear to just accommodate passenger and freight cars of the normal Canadian and American type, but not drawing-room and sleeping cars, nor some of the cars running upon the Intercolonial railroad. This size does not allow of a very satisfactory permanent way, nor does it provide proper space for the platelayers. Such a tunnel constructed in the shale, of brickwork in cement, 1 ft. 10 1/2 in. in thickness, and where feeders occur with cast-iron casing, 15 in. in thickness, with 9-in. flanges, and laid with steel rails weighing 70 lbs. to the lineal yard, is estimated to cost £122 10s. nearly, per lineal yard, or say £1,652,500 from shaft to shaft, or with the land tunnel and contingencies a total sum of £1,971,800.

Sir Douglas Fox is of opinion that to properly accommodate the Canadian and American rolling stock the tunnel should have an internal diameter of not less than 18 ft. Such a tunnel, constructed as specified for the 16-ft. tunnel, is estimated to cost £140 per lin. yd., or say £1,890,000 from shaft to shaft, or with land tunnel and contingencies a total sum of £2,225,500.

It is recommended that before inviting tenders for the main work a shaft placed at Carleton Point so as to be afterward available for permanent pumping and ventilating purposes should be sunk well into the red-clay shale, which lies above the carboniferous sandstone. Borings similar to those taken at the Sarnia Tunnel (viz., from a vessel or platform through 16-in. wrought iron pipes, so as to insure cores of sufficient size and undamaged being brought to the surface) should be made across the straits and down to the carboniferous bedrock. With this information obtained much closer tenders may be expected for the construction of the tunnel.

When the work is resolved upon immediate steps

should be taken: 1st. To connect the existing railroads with the tunnel work.

2d. To establish brickyards at the nearest available site where good clay free from lime is to be found. The quantity of bricks required will vary from 30 to 60 millions according to the size of the tunnel.

3d. To erect dwellings, stores, etc., for the staff and workmen.

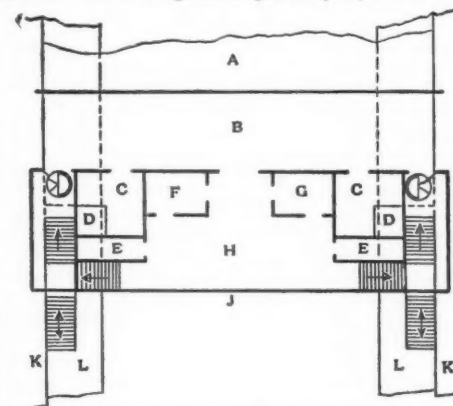
4th. To put down the permanent pumps and provide the necessary plant for temporary purposes.

5th. To install the necessary electric plants and motors.

6th. To provide and fix the compressed-air machinery.

#### The "Harlem Depression" Work on the New York Central.

The New York Central & Hudson River road has lately completed the work, on which it has been engaged for three years, of extending north of the Harlem River, on the Harlem Division, the same style of construction through the city of New York that it built in 1871-4 from the Harlem River southward to Forty-second street. The progress of the work has been reported from time to time in our news columns. The construction consists of depressing the railroad grade and raising the grade of such streets as cross the railroad, and carrying them on overhead bridges. The length of the depression is five miles. It affects about sixty streets, of which twenty are carried over the railroad and the rest discontinued. The change of grade starts at Mott Haven station. At Melrose, about a mile north of Mott Haven, the depression of grade was 7 ft.; at Morrisania, 1 1/2 miles, 7 ft.; at Central Morrisania, 2 1/2 miles, 8 ft.; at Tremont, three miles, 8 ft.; at Fordham, four miles, 10 ft.; at "Woodlawn Road," five miles, the original grade is reached. The two additional tracks, to make a four-track road, were, however, continued to Woodlawn, two miles farther. The street grade is generally 18 ft. 3 in. above



Overhead Passenger Station at Melrose, N. Y.  
A, Roadway of bridge; B, Sidewalk of bridge; C, C, Baggage room; D, D, Baggage elevator; E, E, Closets; F, Ticket office; G, Telegraph office; H, Waiting-room; L, L, Train platform. Windows not shown. Turnstiles at the exits prevent ingress except through the waiting-room.

the rail of the railroad. This does not give clearance for a brakeman on a freight car, but this portion of the road is used chiefly for passenger traffic. The Harlem Division of the Central and the New York, New Haven & Hartford road use this line, but the latter road only for passenger trains. In place of the former two tracks, four tracks have been built throughout the depression, the two outer tracks for locals and the two inner tracks for express trains.

The line is now all ballasted with broken stone from the Harlem River to Williams Bridge—six miles—leaving one mile of gravel ballast between there and Woodlawn.

The depression work has consisted chiefly of masonry for retaining walls and abutments, the former principally for streets running parallel with the track and close to it, and the latter for the overhead bridges. The removal of the earthwork for the depth required was accomplished by keeping only two of the four tracks open to travel at a time; that is, the two new tracks were built on the new grade and were then used by all trains while the old tracks were taken up and (after the excavations had been made) relaid on the lower level. Much difficulty was experienced from the fact that at places the new grade was below the adjacent drainage system of the city, and several thousand feet of culvert was constructed to carry water away from the work. The contract for the graduation and masonry was given May 9, 1888, to the firm of Clark, O'Brien & Westbrook. No definite time for completion was fixed, as travel had to be maintained uninterruptedly; but the work was to be prosecuted as expeditiously as the chief engineer from time to time should direct. The work was substantially completed, except at Fordham, by the summer of 1890. At Fordham there was difficulty in securing an agreement with the authorities as to the overhead bridging and street grades, and this part of the work was not completed until March, 1891.

The total length of retaining wall built is about 33,500 ft., and its average height above sub-grade level 14 ft. This, with the abutments for bridges, makes a continuous wall for about three miles, on both sides, except for a short distance on the east side at the junction





OVERHEAD STATION FOR A FOUR-TRACK RAILROAD.

New York Central &amp; Hudson River Railroad—Harlem Division, Melrose, N. Y.—Looking North.

NOTE.—Way trains run on the outer tracks, and there are two fences, separating these from the express tracks.

tion of the Port Morris branch (Melrose) and on the west side near Fordham, where is a meadow. The masonry altogether aggregates over 114,000 cu. yds., and the total cost of graduation and masonry has been over \$1,500,000. The expenditures for trackwork, station buildings, signal plant, etc., make the total cost about two millions.

One of the noteworthy features of the work is the arrangement of overhead stations at the street bridges, and a view of the station at Melrose is shown herewith. This view shows the southerly side of the building. The north side adjoins the street bridge. Overhead stations have been built at Melrose, Morrisania, Central Morrisania, Tremont and Fordham. They are all built adjacent to one of the sidewalks of an overhead street bridge, and access to the station is from this sidewalk, the outer sidewalk girder being moved out to the rear of the station building so as to put the station practically on a very wide sidewalk. The station is 73 ft. wide across tracks, and 28 ft. longitudinally with tracks. The distance from the floor of station to the train platform is 17 ft., and there is 16 ft. clearance above top of rail. A central entrance from the sidewalk through a short vestibule flanked on either side by small ticket and telegraph offices admits the passenger into a waiting-room about 18 x 32 ft., with closets off each end of the room. A door and stairway at each corner of the waiting-room leads to the train platform below. The stairways are 4 ft. 6 in. wide in the clear. Near each corner of the building adjacent to the sidewalk, and with a door from the sidewalk, is a baggage-room 11 x 12 ft. At each corner of the building at the sidewalk is an exit turnstile and a passageway for passengers from trains.

From each baggage-room an elevator about 5 ft. square, and inclined about 5 ft. from the perpendicular in 16 ft. height, descends to the train platform below. For proper work with very heavy travel, one man would be required up stairs to receive, check and lower baggage, and another below to take it from the elevator and handle it to train. These, with a ticket agent and a gatekeeper in the waiting-room, would make four men required at each station. At present but two are employed, the ticket agent and a baggageman.

The framework of the station is of iron; the interior is of oak finished in hard oil. The exterior is covered with iron, arranged in molded panels, with iron moldings, cornices and brackets, and with ornamental shingled roof, with crests, towers and gables. These stations cost from \$22,000 to \$24,000 each, and the artificial stone platform alongside the tracks about \$1,500 additional.

The retaining walls are recessed to accommodate the track platforms of the stations. The necessities of the streets adjacent and parallel to the track made these platforms and the stairways narrower than was desired, but the frequency and shortness of the local trains and the fact that the stations are so near each other will doubtless obviate trouble from this lack of width.

This improvement is also notable as involving a change from man-operated to automatic block signals, something quite unusual. The automatic system is the Westinghouse pneumatic rail circuit. There are 15 blocks between Mott Haven and Woodlawn, with home and distant signals for each. The electric connection between rails is made by two wires wound around small pins, which are driven tightly into holes in the base of the rail on each side of the joint. The air conduit is a 2-in. steel pipe carried along the line, partly on an offset of the masonry

and partly on low posts. This pipe has sleeve joints about each 800 ft. for expansion and contraction. In the pipe the air is kept at a pressure of 70 lbs., as registered at the compressor-house, and at not less than 68 lbs. at all times at the extreme ends of the system.

Two Norwalk compressors are used, one 8 x 10 in., the other 10 x 12 in. Generally the small one is sufficient to supply all the power required. Two boilers are in position, but only one is in use. The wires from the rails to the home signals are inclosed in boxes, but the wires from home to distant signals are on the poles; they are, however, heavily insulated and protected and therefore not affected by weather, as are ordinary telegraph wires. There are towers for pneumatic interlocking machines (for switches) at Mott Haven yard (2), Melrose (junction), Fordham freightyard and Woodlawn. The signal plant from Mott Haven to Woodlawn, exclusive of boilers, buildings for boilers and compressors, tower-houses, etc., cost \$60,000.

The Harlem depression work has been in charge of Chief Engineer Walter Katté, assisted on the bridges and buildings respectively by Messrs. Thomson and Fouquet, and in the field work by Messrs. Boulard and Naylor.

#### The Railroad Problem.

BY S. Y. M'NAIR.

The railroad industry being that which dominates in this country it is proper that any action taken, whether by legislatures, commissions, associations or the companies themselves, affecting materially the revenues should be carefully considered upon such bases as to data that the results may be foreshadowed somewhat definitely; yet if you inquire of any of the above named what would be the effect on the revenue of a given road if a reduction of 10 per cent. was made on any specific class, or commodity that is unclassified, taking the business of the previous year as a base, they cannot answer. Why? Because no statistics are kept showing the ton miles and revenue by classes and commodities on any road. Many railways make statements showing the tons of the most important articles transported, calculate the per cent. which each bears to the whole, and act upon such basis. That this is fallacious may be readily understood when we consider that a ton may be conveyed any distance from one mile to the whole length of the road. For example, if 10 cars each containing 10 tons of freight are transported 10 miles it would be equivalent to transporting 1,000 tons one mile; but if the same train be run 100 miles it would be equal to transporting 10,000 tons one mile, representing in the latter case ten times as much traffic as in the former, while if stated in tons each would be the same (100). Nevertheless, learned Commissioners talk of lowering rates on low classes and making it up to the railways by increasing on high classes without affecting the average rate and, assuming that there would be no difficulty in this claim as a sequence, that the cost of transportation is not a controlling factor when it is necessary to lower rates; but since they are unable to ascertain the traffic either for the lower or the higher classes they cannot proceed except by guessing, which with rates producing less than two per cent. on stock last year would be unjust to the railways as well as not in accord with business methods. It is true that the keeping of the statistics mentioned will be attended with some little expense, but that action is essential to the complete understanding of the rate question,

a precedent to intelligent legislation and a protection to both railways and the public. When a legislator can rise in his place and say that the wheat traffic on the great Chicago & Buncombe railway amounted to so many ton miles, at such a rate, producing such a revenue last year, and he proposes to reduce that rate, and that the loss of revenue shall be made up by raising the rate on certain high-class articles which are luxuries, and which increase will exactly recoup that road, then he will be acting like an intelligent business man, and all who have given attention to the subject can understand the status of the case. Railway statistics have been too meager upon many subjects, often caused, no doubt, by a desire to economize; but the feeling of the public is such at the present time, that it will be for the protection of their interests if they endeavor to throw light on all their transactions, even at additional expense; otherwise they are liable at any time to be injured seriously by the action of legislators groping in the dark, full of prejudice, and imagining that some great wrong has been done, or for the purpose of pleasing a constituency equally in the dark.

#### REASONABLE RATES.

The laws, both national and state, under which commissions for the supervision and regulation of railroad transportation have been organized insist uniformly that reasonable rates must be charged for carrying passengers and freight, but fail to inform us what such rates are or how they shall be ascertained. The commissions also have been derelict in this respect, though the action of some would seem to indicate that the lowest rates that could be forced upon the railways or that had ever been charged in times of fierce rate wars were eminently reasonable. This action grows out of the fact that in organizing commissions railroad men of experience are ignored by the appointing power and men new to the business are called upon to solve complex mathematical and accounting problems that have bothered the brains of some of the ablest men in the country who have devoted their lives to that business. The friction at present existing between the roads and the commissions on this question cannot continue; either an amicable understanding must be arrived at or the courts must decide.

At present, and until legally instructed otherwise, railways can rightfully claim that stocks, funded debt and other forms of indebtedness represent their capital; that they should have rates that will result in gross earnings sufficient to pay operating expenses and fixed charges, and leave a balance which, added to the income from property owned but not operated, will enable them to declare a fair dividend to stockholders. The above claim as to what constitutes railway capital is admitted and confirmed by the U. S. Commission (see statistical report for 1899, page 23). The rates mentioned, however, cover two entirely different items of traffic—persons and property—and one might be unreasonably high while the other might be too low, yet a reasonable result be the outcome. In other words, the shippers of freight might be unjustly charged, and the passengers correspondingly benefited thereby. It follows, therefore, that all expenditures, of whatever kind or character, must be divided between passenger and freight traffic, so that definite, reasonable, average charges may be arrived at for each, that will cover where joined all expenditures and a fair dividend; having ascertained these charges, and figured the ton miles and passenger miles of the previous year for the respective classes, application of rates to these classes can be made so that the average rate necessary to produce the required revenue may be reached.

The expenses on account of the two kinds of traffic, which do not naturally divide themselves, are now divided on the basis of train mileage. Those naturally indicating the division constitute about two-thirds of the whole, the remaining third being made up for the most part of payments on account of maintenance of way and structures and general expenses. The application of such an appropriate factor for dividing these specific kinds of expenses, coupled with the fact that they constitute the minor proportion thereof, makes it apparent that the results produced are a fair approximation. This method, after consultation with railroad people, has been adopted by the national Commission and has worked satisfactorily. Such being the case, there does not seem to be any good reason why all other expenditures should not be divided between passenger and freight in the same proportion as the expenses. It will be found from various causes that what is reasonable on some lines will not be on others, and that rates to competing points would differ. Adjustments would therefore have to be made so that competitive rates should be the same, while non-competitive should be raised or lowered to preserve the average rate.

The following shows the method of figuring in detail:

#### PASSENGER TRAFFIC.

Since the advent of railroad it has been the custom to charge all the cost pertaining to passenger trains to passengers, notwithstanding that a portion of it should be debited to the cost of transportation of mails and express. This portion, however, for reasons well known, is almost impossible to ascertain. The result is that the cost per passenger per mile is placed at too high a figure; and while it may do for comparison, road with road, yet it does not show the approximate cost, and, taken in con-



nection with the revenue per passenger per mile, is misleading and inequitable.

To remedy this so far as it can be done under prevailing conditions, deduct the earnings from those sources from the cost of the whole passenger service, thus leaving the net expenses for the transportation of passengers, the expenses of course receiving the benefit of any profit that might be made on the mails and express. By treating this last with the mileage, we find the net cost per passenger per mile. The net fixed charges are obtained by first deducting from the fixed charges miscellaneous income not pertaining to operation, and dividing the result between passenger and freight on basis stated. The passenger proportion of this net amount, treated in turn by the mileage, gives us the rate required to cover the fixed charges, and which, added to the net cost of transportation per passenger mile, makes the rate necessary to pay all charges. The difference between this last and the revenue per passenger mile will show the surplus or deficiency in the rate.

Taking the statistics published by the United States Commission for 1889 on 12 representative Western lines, and figuring on the above basis, the result is that six show a surplus and six a deficiency. The average revenue per passenger per mile on all is 2.269 cents; the average net cost, 1.557 cents; the average portion of rates to cover net fixed charges .780 cent, and to cover all expenditures 2.337 cent, leaving a deficiency in the average rate of .068 cent, and showing that these roads were not only unable to earn the passenger proportion toward a dividend, but could not even cover that re-

The rate per ton per mile for all charges on the Western lines is lowest on the Illinois Central (.551 cent), the next the Alton (.737 cent), and the highest on the F.E. & M.V. (1.590 cents). On the Eastern roads the lowest is the L. S. & M. S. (.558 cent), the next the Pennsylvania (.571 cent), and the highest the Boston & Albany (.842 cent).

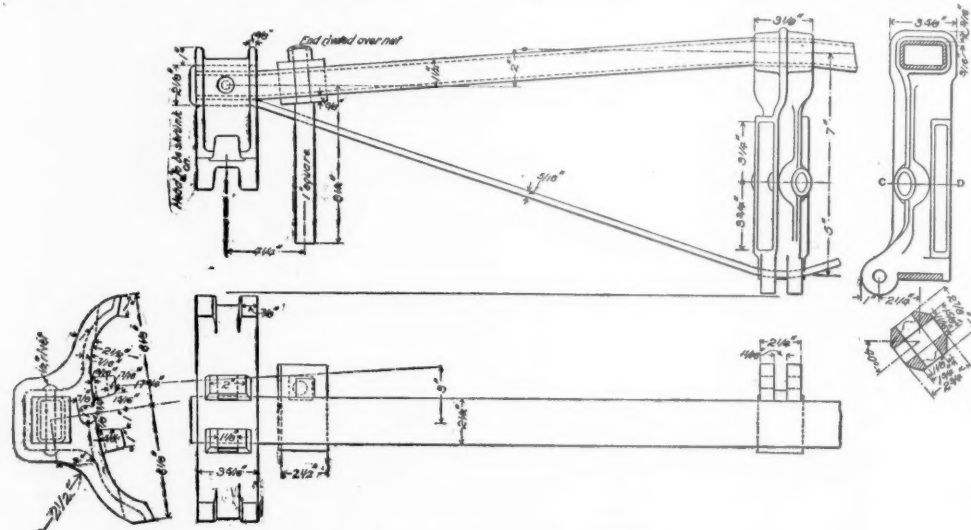
To ascertain the additional average rates required on account of dividends, first conclude what a fair dividend should be, divide that between passenger and freight on same basis as expenses, and then apply the passenger and freight mileage respectively to them.

The foregoing are approximate figures, but sufficient for all practical purposes. Actual figures, of course, cannot be made, and if they could they would only show that the variations favored slightly one kind of traffic at the expense of the other, the earnings of the two combined being the same in either case and covering all charges and dividends.

I have thus made bold to formulate a method of procedure which if adopted would do justice to all and which could be tested by any mathematician with the data in hand, whether he was a railroad man or otherwise.

#### The Standard Rectangular Brakebeam.

A light and strong hollow brakebeam is shown in the accompanying cut, and it is known as the "standard rectangular" brakebeam. It is formed of a rectangular pipe  $2\frac{1}{2} \times 1\frac{1}{4} \times \frac{1}{4}$  in., the long side of the rectangle being placed vertically. The tension member is made of a



STANDARD RECTANGULAR BRAKEBEAM.

quired for exditures. The deficiency in money is \$1,220,135 and the length of road represented is 30,468 miles.

Seven Eastern lines, representing 9,615 miles of road, treated in the same manner, show the following averages per passenger per mile:

Gross revenue, 2.008 cents; net cost, 1.142 cents; proportion to cover net fixed charges .471 cent, and to cover all 1.613 cents, leaving a surplus in the rate of .395 cent, and in money of \$9,329,095. Two of the roads, however, showed a deficit.

The chief reason that Eastern lines do better than the Western is because the volume of traffic on the latter is only about one-fourth that on the former, while the average rate is very little more.

#### FREIGHT TRAFFIC.

The procedure in figuring on this traffic is the same as that on passenger, except that there is no deduction from the operating expenses. Taking the same 12 Western roads that were used in the passenger business the following averages per ton per mile are obtained:

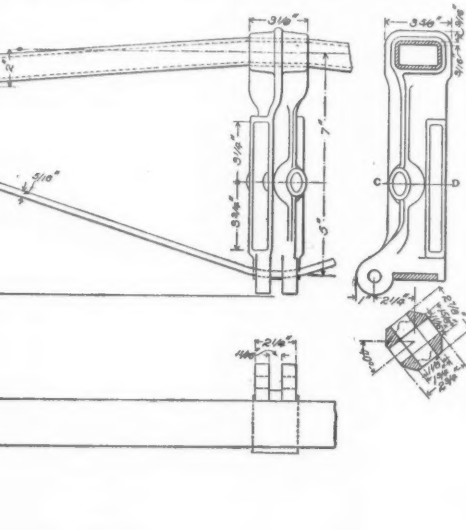
Gross revenue, 1.040 cents; cost, .635 cent; to cover net fixed charges, .203 cent; to cover all, .838 cent, leaving a surplus of .202 cent. Two roads showed a deficit, and the surplus in money applicable to dividends, improvements, etc., was \$21,788,218.

The averages on the six Eastern roads are:

Gross revenue, .713 cent; cost, .493 cent; to cover net fixed charges, .131; to cover all, .624 cent, leaving a surplus of .089 cent, or, in money, \$14,829,764. Each of these roads showed a surplus. The surplus per mile of road on Western lines was \$715, and on Eastern \$1,542. The volume of business on the latter was about five times that on the former.

On the Western lines the deficiencies in the passenger rates showed clearly that the burden of earnings placed on the freight is too large proportionately. The same is true of the Eastern lines in a less degree.

The rate per passenger mile required for all charges on the Western lines is the lowest on the Illinois Central (1.771 cents), the next the Alton (1.820 cents), the next the Union Pacific (1.936 cents), and the highest the Chicago, S. F. & C. (4.964 cents). The lowest on the Eastern lines is the Boston & Albany (1.192 cents), the next the N. Y. Central (1.417 cents), the next the Pennsylvania (1.617 cents), and the highest the Michigan Central (2.201 cents).



$2\frac{1}{2}$  in.  $\times$   $\frac{1}{8}$  in. bar of steel bent around the ends of the pipe as shown. The heads are made of malleable iron or cast steel, and shrunk on to the ends of the beam over the tension and compression members. To prevent the heads from sliding laterally, in case they should become loosened, a rivet is put through the head and pipe as shown. The strut is formed of malleable iron, with a third point of support as usual.

The wheel guard is made of 1 in. square iron, turned to  $\frac{3}{8}$  in. diameter on one end and threaded for a nut. The clamp around the pipe is formed of  $\frac{3}{8}$ -in.  $\times$   $2\frac{1}{2}$ -in. flat iron, bent to conform to the beam and to receive the guard. The heads are made of any desired form to take any shape of shoe.

This brakebeam is constructed as follows: The tension members are bent exactly to the desired length and shape and are heated between the ends. They are then placed in position and while still hot the heads, having been previously heated, are put on the ends; the whole beam then cools with the result of bringing a strong initial tension in the tension member and putting a camber in the compression member.

This beam has been tested by R. W. Hunt & Co., of Chicago, and found to meet the requirements of the Master Car Builders' Association. One of the important advantages claimed for it is vertical stiffness. When the brakeshoes become worn and the brake lever stands at an angle, there is little chance of this beam bending down under the vertical load, which is then placed upon the centre of the beam.

This beam is made in Chicago and sold by the Northwestern Equipment Co., Rookery Building.

#### The Zigzag Tunnel—New York, Ontario & Western.

The completion of the Zigzag Tunnel on the New York, Ontario & Western is the latest of a series of improvements and additions to the property of that company which must result in a continual progressive effect upon its net earnings. The southern end of this tunnel is at the station called North Walton, about 180 miles from Weehawken, where it has heretofore been necessary to divide the freight trains into several parts, and to switch them by inclined planes to a height of 160 ft. above the true grade, and down again on the other side of the hill, involving, of course, a considerable expenditure for

each car taken over the switchback. An elementary sum in arithmetic would determine when the traffic had attained such dimensions as to justify the outlay of money necessary to construct the tunnel, but that little mathematical effort would not by any means secure the \$300,000 or so, to pay the cost of the undertaking. Nevertheless, the President of the road was enabled to proceed with the work, and on Friday last, with a party of the officials of the road, he made the first passage through the mountain upon which the assault was begun about two years ago.

The approaches at each end of this tunnel, in open cutting, are quite formidable, but are in material which promises to give no further trouble.

It is said that the rate of progress made in the bore of the tunnel was the most rapid yet attained in that class of work, beating the best previous record; and this is ascribed in some part to the mode of driving prescribed by Mr. Childs in his specifications. These required that the heading should be carried forward at grade, and the roof taken out afterward; it being his object in this manner to preserve the integrity of the roof beyond the line of the arch and thus to secure the full value of the rock above the excavation. This mode of executing the work was objected to by the bidders for the job; but it proved to be advantageous to the contractors as well as of the expected benefit to the roof. It was found that the heading could in this way proceed uninterrupted, while the excavation of the upper half of the section followed without interference from the work in the heading. This course of proceeding seems like a natural one, and, no doubt, will be frequently followed by those who know of the success which attended its use at the Zigzag.

The opening of this tunnel occurs just in time to relieve the pressure of the traffic, which had lately developed up to the entire capacity of the inclined planes, which threatened to become a serious obstruction. A great part of this somewhat sudden influx of business is derived from the new branch to Scranton, which leaves the main line at Hancock Junction, almost exactly half way between Weehawken and Oswego, crosses the Delaware, surmounts the hills at about 2,300 ft. above tide, and, passing through the heart of Carbondale by a bold stroke of strategic engineering, reaches the very business centre of the city of Scranton, where, by a favorable arrangement with the Central Railroad of New Jersey, the N. Y., O. & W. shares the use of that company's admirable terminal arrangements. By the construction of this branch of about 51 miles in length, the N. Y., O. & W. has become one of the "coal roads," with all that that implies.

The coal traffic coming upon the main line at Hancock Junction is thence conveniently distributed, east and west, to every part of the Ontario's system, which may be well likened to the two extended arms and hands of a prostrate giant, the fingers representing the numerous ramifications over which the fuel reaches its consumers. This business began in July, 1890, at the rate of 25,000 tons a month, and the year concludes this month of June with a tonnage of 60,000.

This giant has been prostrate for many years; but now that this energizing circulation has begun to vigorously affect his whole system, we look to see him rise, and expect that he will soon be keeping step with his compeers.

#### The Railroads of New South Wales.

The report of the Railway Commissioners for the quarter ending March 31 was submitted early in May to the Minister for Railways.

The following are the principal results of operation of the railroads:

	Quarter ending March 31, 1890.	Quarter ending March 31, 1891.
Miles open.....	2,182	2,182
Revenue (passenger).....	\$277,149	\$322,725
Merchandise.....	\$337,623	\$418,409
Expenditure.....	\$383,338	\$431,870
Train miles run.....	1,896,027	2,067,500
Earnings per train mile.....	6s. 5½d.	7s. 15½d.
Expenditure per train mile.....	4s. 10½d.	5s. 11½d.
Percentage—Expenditure to earnings.....	62.35	58.27
Number of passengers.....	4,164,998	4,872,759
Tonnage of goods traffic.....	820,586	1,123,134
Tonnage of live stock traffic.....	23,621	27,575

NOTE.—Information as to the cost and earnings of trains per ton per mile cannot be given, as a large proportion of the train mileage is used for carrying both goods and passenger traffic.

The following figures are given for the half year also:

	1890.	1891.
Miles worked.....	2,182	2,182
Revenue.....	\$1,421,397	\$1,655,275
Expenditure.....	\$1,193,899	\$1,381,894
Expense, per cent. of earnings.....	57.12	56.01

The gross revenue has increased about 16 per cent., while the expenses have increased but 14 per cent. It is said that there has been much improvement during the year in the condition of permanent way and rolling stock, expenditures for which have been charged up to cost of operation. On the whole, the Sydney papers look upon these results as very flattering to the Railway Commissioners, and say that they afford fresh proof of the wisdom of removing the railroads from political influence and putting them under the direction of men

\* See the *Railroad Gazette*, Sept. 28, 1890, p. 657, for a more detailed description of this road and its traffic relations.



actuated by the idea of working them for the benefit of the community. The Colony of New South Wales has stopped railroad building, as is seen from the figures given, and it is hoped that now the railroad system of the country will soon begin to pay interest on cost of its construction and "relieve the general tax payer from the unjustifiable burden to make up an annual deficiency in a department that should be perfectly well able to maintain itself." In Victoria, on the other hand, overbuilding still goes on, and the railroads are worked at a heavy loss.

#### Some Track Experiments on the Deflection of Rails.

BY JAMES E. HOWARD.

The last published report of the tests of metals at the Watertown Arsenal contains an account of some track experiments made on the Boston & Albany at Allston, Mass. The officials of the road furnished one of their heavier passenger locomotives for the purpose of the experiments, in which Mr. P. H. Dudley was associated.

The experiments, aside from the interest which attaches to tests of this novel character, furnish, it appears, information of more than ordinary importance in a line of inquiry but little entered upon, but which aims at the direct solution of certain questions by observing

A complete set of observations was next made with the rail unloaded. Then the same observations were repeated with the locomotive run into position, the differences indicating the amount of depression under the conditions then imposed. With reference to the locomotive these observations covered a section from one of the tender wheels, which rested over the end of the rail, to a point about midway the forward driver and the rear wheel of the leading truck. At the last named point the minimum depression of the series was noted, namely, .0067 in. Directly under the forward driver the depression was about .115 in. The lowest place in the rail in the vicinity of this wheel was a little to the rear of it or directly over tie No. 23. The depression was less between the drivers, then increasing, and reaching the maximum under the rear driver where the amount reached .1536 in. The rail was less depressed between the rear driver and the first wheel of the tender, and again showed increased depression due to the weights of the tender wheels until we reach the end of the rail, where the observations stopped. These waves in the rail are graphically shown by diagram No. 1.

Measurements of the strains in the base of the rail were taken as follows: Gauged lengths of 5 in. each were laid off at intervals on the upper surface of the base, and defined by centre punch marks. When the rail was

the whole quite favorable to the rail. The greatest weight is at the middle of the length of the rail where the drivers rest. It would seem, in case the joints possess less strength than the body of the rail, there would be other positions, when the drivers were nearer the end of the rail, in which greater stresses than here found might be introduced by the same locomotive. Then we might further consider the effect of the unbalanced parts—that is, unbalanced in a vertical direction—when the locomotive is moving at a high rate of speed and the probability that rails might be encountered resting upon ties not so well tamped as in the present instance, affording less support and allowing greater straining of the metal, unfavorable combinations increasing the observed stresses to a fairly high limit.

Duly considering the cold-rolling of the top of the head by wheel pressures exceeding the elastic limit of the metal, thereby diminishing its ductility and introducing internal strains, can there be any surprise that rails occasionally fracture? And we recognize the strong probability that fracture may in certain cases begin at the head and extend downward through the web to the base.

Another fact is prominently shown by these experiments, that the distance between ties does not represent the distance which should be used in computing the transverse stiffness or strength of the rail when in the track. Why the strength of a rail is so persistently regarded as though it rested on absolutely rigid supports equal to the distance from centre to centre, or from the inside edges of adjacent ties, is difficult to understand; but these experiments dispel many doubts, and show that the weight of the locomotive and other parts of a train are carried over a considerable length of rail, and do not receive entire support from the nearest ties.

In the example of the tensile stresses in the base of the rail due the weight of the rear driver, we note that not only is the metal in a state of tension directly under the wheel, but it is also in a state of tension where it receives the support of ties 15 and 17, and even at the gauged length No. 18 the metal is still in tension. Under the forward driver and in its immediate vicinity five of the gauged lengths indicated metal in tension. The metal of the base which was in compression was located

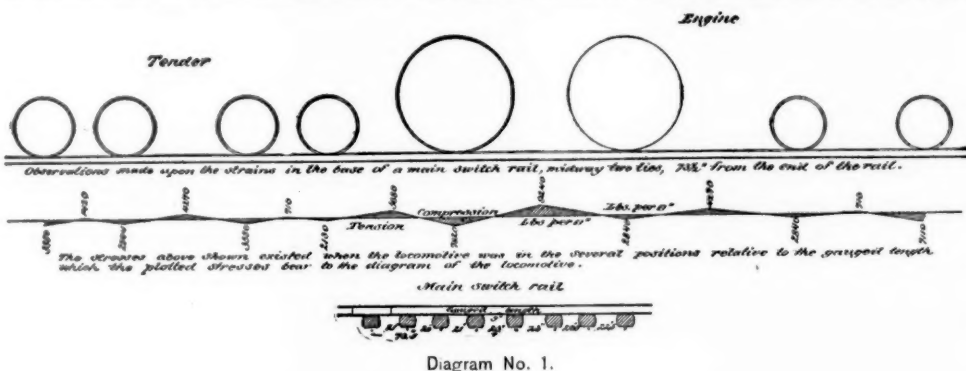


Diagram No. 1.

the actual behavior of the material under working conditions. The present observations were intended to supplement the tests of rails made with the testing machine, assisting in the intelligent application of results there obtained.

The track experiments include two distinct sets of observations: First, those which showed the bodily depression of the rail along its length, due to the weight of the locomotive in one position; and, second, the measurement of the strains in the base of the rail, the latter showing the location and magnitude of the tensile and compressive stresses with reference to the weights on the wheels as modified and distributed by the supporting power of the ties and the roadbed.

The principal observations were made upon an outer rail of track No. 1, which rail weighed 72 lbs. per yard, and was 4 1/2 in. high by 4 1/2 in. width of base. The relative size and spacing of the ties are correctly shown by diagram No. 1. The ties were of chestnut wood, resting on gravel ballast. The total weight of the locomotive was 164,670 lbs., of which 73,790 lbs. belonged to the tender, which was fully loaded with coal and water. The engine weighed 90,880 lbs., of which 61,450 lbs. was carried by the drivers and 29,430 lbs. was on the leading truck.

To determine the depression of the rail caused by the locomotive in the position shown by diagram No. 1, a series of bench marks was established on a row of stakes driven alongside the rail, and at a distance of 3 ft. from it. The relative heights of some nails in the tops of the stakes and points selected on the base of the rail, were determined by means of a sensitive astronomical spirit-bubble mounted on a bar, which carried a screw micrometer. A set of readings with the level and micrometer was taken with the rail unloaded and again when under the weight of the locomotive, the difference between the readings showing the amount the rail was depressed with reference to the bench marks. It was not supposed that the bench marks themselves were beyond the influence of the weight of the locomotive, but were quite within the zone of road-bed, which was sensibly depressed by the presence of so great a weight. In comparison, however, with the total observed depression of the rail, the local disturbance in level which affected the row of stakes was doubtless slight in this instance. The stakes were arranged in places opposite the ties and midway adjacent ones; the 25 stakes thus employed covered a section of track about 22 1/2 feet long.

Readings begun with the rail unloaded were interrupted by a heavy shower of rain, after which the rail at the four places when measured appeared to have been depressed amounts ranging from .0071 in. to .0168 in. The experiment then gave way to trains passing on their regular time, after which, when the test was resumed, the rail in some places appeared to have recovered part of the height lost during the shower, while in other places it was slightly lower than before. It was inferred from this that if a critical examination was made from time to time, the rail would probably be found to have changed its position slightly after the passage of each train.

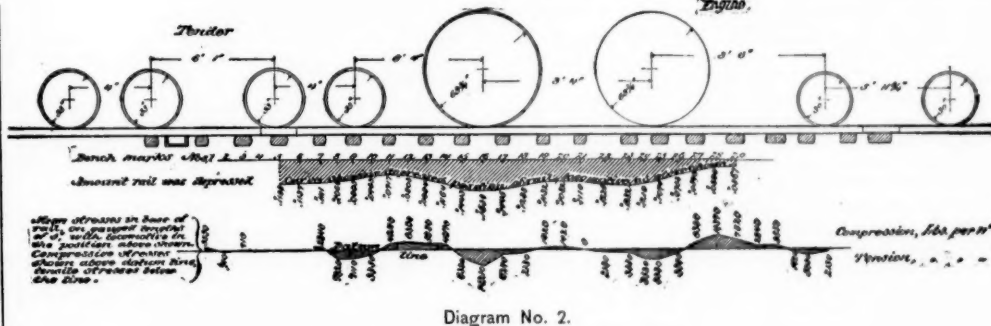


Diagram No. 2.

#### SOME TRACK EXPERIMENTS ON THE DEFLECTION OF RAILS.

loaded, any change in these lengths indicated that that part of the rail was strained by tension or by compression, according as the gauged length was made longer or shorter. Knowing the modulus of elasticity of the metal to be about 30,000,000 lbs. per sq. in., the stresses corresponding to the changes in the gauged lengths are readily computed; and furthermore, as the stresses in such a rail are nearly proportional to the distances of the fibers from the neutral axis, we may reach a close approximation of the mean stresses at the lower surface of the base by computation based upon the observations at the gauged lengths.

Such computations were made and the results are also shown on diagram No. 1. The mean stresses are plotted directly under that part of the rail to which they refer. Thus we see that under each of the wheels the metal at the base of the rail is strained by tension and between the wheels there are strains of compression. The highest tensile strain corresponded to 14,210 lbs. per sq. in. This was under the rear driver, which occupied a position between two ties favorable for straining the rail. The forward driver rested nearly over a tie, yet here the base was under tensile stress of 8,530 lbs. per sq. in. Between the drivers the rail was comparatively straight, here the compressive stresses only reaching 1,420 lbs. per sq. in. At gauged length No. 28, about 3 ft. in front of the forward driver, the compressive stress was 11,370 lbs. per sq. in.

An inspection of the diagram will show the tensile and compressive stresses as they were found in other places in addition to those just described. Of course the metal in the head of the rail was under the opposite kind of stress to that found at the base. The neutral axis of this rail being about midway its height, the maximum stresses at the top and the bottom would be nearly equal; that is, for example, the tensile stress at the top of the head at gauged length No. 28 would be about 11,370 lbs. per sq. in., the same in amount as the compressive stress in the base.

These figures enumerated all refer to the depression and deflection of the rail with the locomotive in the position indicated by the diagram, which perhaps is one on

midway the wheels. Adding together the maximum tensile and compressive stresses, we have, as the sum representing the mean range of stresses in the base, 25,580 lbs. per sq. in. This is really below the actual stresses, as our measurements and computations refer to the mean effect taken over lengths of 5 in. each, and according to the manner of loading the stresses might vary in the gauged lengths—hence we are recording mean stresses, and not maximum ones.

On diagram No. 2 are plotted the results of another series of measurements made on the base of a main switch rail taken at a distance of 73 1/2 in. from the joint. In this series all the measurements refer to one gauged length of 5 in., the locomotive occupying successively 15 different positions. After establishing the gauged length, which was taken between two ties, the locomotive was run onto the rail until it reached a position with the forward wheel of the truck directly over the gauged length when the first observation was made. The gauged length was then found elongated .0010 in., which referred to the under surface of the base, and stated in pounds per sq. in. represented a fiber stress of 7,110. Between the truck wheels the metal was under the low compressive stress of 710 lbs. per sq. in. Following along in the order the strains were measured we note the stress when the rear wheel of the truck had reached a position over the gauged length of 2,840 lbs. per sq. in.; then came 4,270 lbs. between the rear truck wheel and the forward driver. When under the forward driver the tensile stress was 2,840 lbs. per sq. in., whereas under the rear driver the stress reached 7,820 lbs. When between the drivers the compressive stress in the base rose to 9,240 lbs. per sq. in.; and it will be further noticed, as recorded on the diagram, that comparatively large compressive stresses existed when the gauged length was between the rear driver and the first wheel of the tender; also when between the second and third wheels of the tender.

On this diagram two important facts are strikingly illustrated. In the first place, we note the tensile stress caused by the forward wheel of the truck was 2 1/2 times that caused by the forward driver, and not far



below the stress caused by the rear driver, notwithstanding the weight carried by the truck was less than one-half that on the drivers. In explanation of this paradoxical behavior it is thought that an abrupt wave of deflection went before the locomotive; that the bend in the rail was a sharp one, due to the yielding of the supports of the rail in the immediate vicinity of the load, and that there was no weight on the rail in front of the truck to keep it down. When the drivers had reached a position over the gauged length the rail was loaded in each direction, although the joint intervened in one direction, and was in the condition of a continuous girder, the fiber stress being less in consequence.

Secondly, we note that the compressive stresses were greater than the tensile stresses of the preceding or succeeding positions of the locomotive in a number of instances. The maximum stress observed was one of compression which was 9,240 lbs. per sq. in., against 7,820 lbs. per sq. in., the highest recorded tensile stress of the series. Therefore at this place in the rail there will be a greater tendency to fracture by tension from the head of the rail downward than from the base upward. When the rail is new the metal in the base might be at a disadvantage on account of its then lower ductility; but after the cold-rolling of the head the conditions would in many cases be reversed, and great brittleness in the head might result without there having been in the meantime any special impairment of the original ductility of the base. In the two series of observations we see different relative effects from the several wheels. Under strict investigation no two rails would be expected to display exactly the same behavior; the size, spacing and tamping of the ties would introduce variable elements of resistance under rails of the same form and weight.

A further example of the stresses caused by the wheel pressures was shown by measurements made on the base of a stub-switch rail  $4\frac{1}{2}$  in. high, at a place midway two ties, which were spaced 23 in. apart on centres. On a 5-in. gauged length the metal of the base of the switch-rail was strained approximately as follows: Under the front truck wheel, about 7,000 lbs. per sq. in.; under the rear truck wheel, 7,600 lbs.; under the front driver, 13,000 lbs.; and under the rear driver, 15,000 lbs. per sq. in.

So few observations cannot, of course, solve the problem what the maximum stresses are in the most strained part of the rail, but they are valuable and suggestive so far as they go. Strain sheets are carefully prepared showing the kind and magnitude of stresses in iron bridges, and is it not equally desirable that the stresses in rails be understood? For the most part, or at least in the principal members of a bridge, the stresses act in one direction only, and where alternate stresses of tension and compression occur a liberal margin of strength is allowed, and well it should be. Whatever may be said about overstraining metal in one direction as regards a tendency to cause final rupture, it is very certain that alternate stresses will soon end in the rupture of the metal, although the fiber stress is apparently much below the original tensile strength of the material, and rupture may happen under certain circumstances without the display of any ductility whatever, as shown by elongation or contraction of area. In a rail it is alternate stresses that we constantly have to provide for.

The writer hopes to be able to present at some later date additional track experiments made with special reference to the behavior of rails in the vicinity of the joints and show the characteristics peculiar to different types of joints.

WATERTOWN ARSENAL, Mass., June 4, 1891.

#### The Mills Pneumatic Gate.

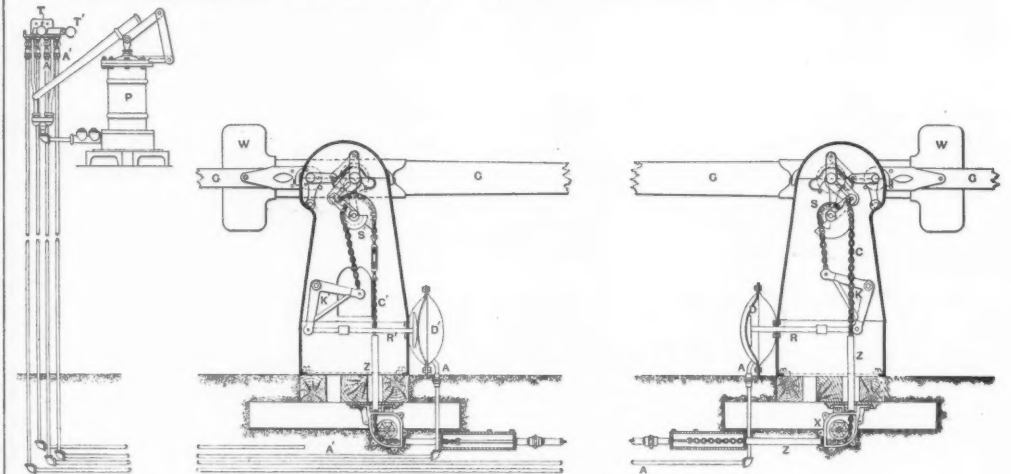
The Mills pneumatic gate has since its first introduction undergone a radical improvement. Originally the power was applied by means of compressed air acting through a cylinder, but, the friction of the piston proving too great, a flexible diaphragm inclosed in an air-tight casing was substituted, with excellent results.

As now constructed, the gate consists of roadway and sidewalk arms carried with the counterbalance weights by pinions in the iron gate posts, which are cast in sections in the usual way. A set of cranks and levers connects the gate-arm pinion with the main sheave *S* in such a way as to lock the arm in both the vertical and horizontal positions. To the front of each gate post is fastened a diaphragm case *D*, which is cast in two halves which are bolted together through their flanges and inclose a flexible diaphragm. This diaphragm divides the chamber into two compartments, and is free to move at its centre over a range of several inches as the pressure of air at one side is increased or reduced, the air pressure on the opposite side remaining always normal. The thrust of the diaphragm is received on a large disc which forms the head of the plunger rod *R*. The other end of this rod is attached to one arm of the bell crank *K*, through which the motion is communicated by a chain to the main sheave *S*, and thence through the system of levers before mentioned to the pinion of the gate arm.

The gates are operated in pairs, one post being placed on each side of the street and the main sheaves being connected by the chain *C*. This chain, passing through the conduit pipe and around pulleys, is well drained and so is not affected by frost. It serves the double purpose of keeping the gate arms in the same relative positions and of carrying the power from the diaphragm of one gate

post to the main sheave of the other, thus making it possible to utilize one diaphragm for raising both gates and the other for lowering them.

As indicated in the cut, the compressed air is supplied through iron pipes from a simple form of air pump in the elevated gatehouse. Close to the pumps is a set of taps *T*, by means of which the current of air may be turned into as many or as few of the pipes as is desired. For instance, by means of the tap *T* the current of air may be turned into either of the pipes *A* or *A'*, or it may be cut off from both of them. The apparatus is represented in the position it would occupy immediately after lowering the gates. If it is now desired to lift them, the tap *T* would be turned to the left so as to admit the air to the pipe *A*. The pump, being operated, the compressed air would pass through the pipe *A* to the chamber *D*, forcing out the diaphragm and the plunger rod *R*, turning



THE MILLS PNEUMATIC CROSSING GATE.

Made by BOGUE & MILLS MANUFACTURING COMPANY, Chicago, Ill.

the bell crank *K* and the sheave *S*. The chain *C* will carry an equal motion across to the sheave *S'* and the bell crank *K'*; and the rod *R'* being forced back into the chamber *D'*, will carry the diaphragm with it and leave it in position for the operation of lowering the gates.

In practice, two strokes of the pump lever are required to raise or lower a single pair of gates, and as the pump works easily it is possible for one man to handle six pairs of gates where the traffic is moderate and a good view of the track and streets is obtainable.

#### Train Accidents in the United States in May.

##### COLLISIONS.

###### REAR.

1st, 7:10 p. m., on Wheeling & Lake Erie, at Norwalk, O., an extra passenger train running at full speed collided with a string of empty cars which a yardman had carelessly run upon the main track. The engine was ditched, and, together with half a dozen coal cars, badly damaged. Engineer and baggage-master injured.

2d, on Cincinnati, New Orleans & Texas Pacific, near Clinton, Miss., a passenger train which had come to a stop unexpectedly, owing, it is reported, to some mishap with the air brake, was run into by a following freight train, damaging the rear car and injuring 2 passengers.

2d, night, on New Orleans & Northeastern, at Laurel, La., a passenger train ran over a misplaced switch and into some freight cars standing on a siding, wrecking several of them and derailling the engine and forward cars of the passenger train. Engineer injured.

4th, midnight, on Norfolk & Western, at Tucker's Siding, Va., a freight train waiting on a siding for orders was run into by another freight train, wrecking 15 cars and throwing the colliding engine down an embankment. Fireman badly injured and a tramp killed.

7th, midnight, on Louisville & Nashville, near Bangor, Ala., the caboose and 7 cars of a freight train broke loose in ascending a grade and were stopped. The forward section ran some distance, when the balance of the cars broke away from the engine and ran back uncontrolled into the rear portion of the train, both then continuing and colliding with a following freight train. Several cars were wrecked, took fire and were burned up. Engineer and 3 tramps injured and 1 tramp killed.

9th, on Cleveland, Akron & Columbus, near Columbus, O., a freight train collided with a box car, wrecking engine and 8 cars. The fireman was thrown out of the cab and seriously injured.

10th, on Shenandoah Valley road, near Cloverdale, Va., a freight train which had stopped at a water tank was run into by a following freight. The latter broke in two and the rear part ran back down grade and collided with another freight. Four engines and a number of cars were wrecked, 2 trainmen killed and another injured.

10th, 10 p. m., on Toledo, Ann Arbor & North Michigan, near Shepherd, Mich., an extra freight train collided with a string of 14 cars of logs standing on the main track. The shock caused them to run back into some other cars which were being loaded with logs, making a pretty bad wreck, killing 3 workmen and injuring 13 others.

12th, on Chicago, Milwaukee & St. Paul, near Dubuque, Ia., a freight train ran into the rear of another freight which projected over the main track from a siding, and the engine and 6 cars went into the Mississippi River. The engineer went down with the locomotive and was drowned, and the fireman and a brakeman were injured in jumping.

18th, on Louisville & Nashville, at Phelans, Ala., a freight train ran into the rear of another freight, wrecking the engine and a number of cars, including 3 oil tank cars. Fire broke out and consumed the wreck. Two trainmen killed and one fatally injured.

20th, on Atchison, Topeka & Santa Fe, at St. Joseph, Mo., a passenger train ran into the rear of a derailed

circus train, wrecking several cars and injuring 5 circusmen.

21st, 11 p. m., on Southern Pacific, near Borden, Tex., a special passenger train loaded with soldiers became separated by reason of a defective coupling between the tender and baggage car. The reports indicate that the breakage occurred on a descending grade, and that after running some distance the engineman found himself unable to keep ahead of the cars and jumped off. The cars soon ran into the engine and were piled up in a bad wreck, killing one soldier who was in the baggage car, and injuring 4 others. The automatic brake did not act on the passenger cars, and the trainmen say that the cock on the tender had been maliciously shut.

23d, 9 p. m., on Cincinnati, New Orleans & Texas Pacific, at Melville, Tenn., southbound express train No. 1, running 25 miles an hour, struck the rear end of passenger train No. 7, running about 12 miles an hour, damaging engine and 4 cars. Engineer and fireman jumped and were killed. It appears that the runner of No. 1 had a clear view of 4,000 ft., and that he passed the last tele-

graph station, 7 miles distant, only about 3 minutes behind No. 7.

25th, on Pennsylvania road, at Nescopee, Pa., a freight train ran into the rear of another freight on a curve, damaging a caboose and injuring 6 trainmen.

27th, on Ohio River road, at Point Pleasant, W. Va., a freight train ran over a misplaced switch, and collided with some freight cars standing on a siding, a number of which, together with the engine, were badly damaged. Two trainmen, a man in charge of stock and a tramp were injured.

30th, on Pennsylvania, at Lindner, N. J., a freight train stopping at a water tank was run into by a following freight, doing some damage and injuring a fireman.

31st, on Norfolk & Western, near Luray, Va., a freight train ran into the rear of another freight on a trestle which was being replaced by an iron viaduct, derailling several cars. The trestle gave way under the shock, and the caboose and 2 cars of the foremost train, and the entire second train, consisting of engine and 20 cars, went down into a deep ravine. One trainman killed and another fatally injured. The rails were wet and the colliding train approached the trestle uncontrolled. And 16 others on 12 roads, involving 5 passenger and 23 other trains.

##### BUTTING.

1st, on Pittsburgh & Lake Erie, near West Newton, Pa., collision between a southbound freight train and an empty engine, wrecking both locomotives, killing a fireman and injuring an engineer.

7th, 11 a. m., on Pittsburgh, Cincinnati, Chicago & St. Louis, at Tuscarawas, O., butting collision between two passenger trains at a point where the line changes from double to single track, the train approaching the single track overrunning the fouling point. The engines and forward cars of both trains were wrecked. A baggageman was killed and 3 postal clerks and an express messenger were injured.

13th, on Cleveland, Lorain & Wheeling, at Tippecanoe, O., a southbound passenger train standing at the station was run into by a northbound freight train, wrecking both engines. Four passengers were injured, one of them severely.

17th, on Chicago & Erie, at Huntington, Ind., a passenger train entering the yard at too high a speed collided with a freight train standing on the main track, wrecking both locomotives. One trainman killed and another seriously injured. It appears that the air brake of the passenger train had been tampered with by two tramps stealing a ride, who were at once arrested.

18th, on Baltimore & Ohio, near Barnesville, butting collision between a freight train and a light engine, due to the crew of the latter misunderstanding orders. A fireman was fatally injured.

19th, on Southern Pacific, near Tehachapi, Cal., butting collision between a passenger train and a light engine running against orders, disabling 3 engines and injuring 2 trainmen and 1 passenger.

23d, on Baltimore & Ohio, near Vanbibber, Md., butting collision between two freight trains, injuring 4 trainmen, two of them seriously.

27th, on Columbus, Shawnee & Hocking Valley, near Fultonham, O., butting collision between a special officers' train and a light engine, doing considerable damage, slightly injuring a fireman and several occupants of the special.

29th, on Pittsburgh & Western, at Wittmer, Pa., butting collision between two passenger trains, one of which approached the station at too high speed, damaging both locomotives and several cars. Two trainmen injured. There were 2 freight cars in the front of the train at fault, which apparently prevented the use of the train brake.

And 9 others on 8 roads, involving 18 other trains.

##### CROSSING AND MISCELLANEOUS.

2d, on Louisville, Evansville & St. Louis, at Belleville, Ill., a freight train entering a siding was run into by another freight, disabling the engine and wrecking several cars. One tramp killed and another badly injured.



2d, on West Shore, at Marlborough, N. Y., a freight train was run into by an empty engine, wrecking engine, caboose and several cars. Brakeman killed and engineer and fireman injured, the engineer by striking a switch-stand in jumping from the cab. The collision seems to have resulted from a failure to signal the empty engine, and a coroner's jury decided that this was the fault of a brakeman who "failed to hear the order given by the conductor."

7th, on Deadwood Central, near Lead City, Dak., a passenger train collided with a runaway freight car on a steep grade, badly damaging the engine. The engineer, who had jumped from the locomotive with the lever reversed, got into the cab immediately after the collision to prevent the train running back down the grade, and was severely scalded.

11th, on Pennsylvania, near Conshohocken, Pa., collision between a passenger train and a coal train, doing considerable damage and seriously injuring a conductor.

13th, on Minneapolis, St. Paul & Sault Ste. Marie, near Dresser Junction, Wis., a passenger train collided with some runaway flat cars, badly damaging the engine, killing the fireman and injuring the engineer.

18th, on Pittsburgh, Cincinnati, Chicago & St. Louis, near Steubenville, O., a passenger train ran into a work train which was entering a siding. The engine was derailed and went over an embankment, severely injuring the engineer.

22d, on Manistee & Northeastern, near Manistee, Wis., a logging train was run into at the side by another logging train which was coming from a spur onto the main track, injuring a conductor.

22d, night, on Montana Union, at Butte, Mont., a collision occurred in which an engine and several cars were wrecked, and 3 persons injured.

29th, 4 p. m., at the crossing in Elizabeth, N. J., a Philadelphia & Reading passenger train ran into a Pennsylvania freight train, wrecking 1 freight car, derailling several others and overturning the passenger engine, severely scalding the engineer.

31st, on Philadelphia & Reading, in Philadelphia, Pa., some cars of a switching freight train broke away from the engine, and ran back down grade into some standing freight cars, smashing a number of them and knocking down a signal tower, injuring the signalman.

And 6 others on 6 roads, involving 11 freight and switching trains.

#### DERAILMENTS.

##### DEFECTS OF ROAD.

8th, on Illinois Central, near Duquoin, Ill., a passenger train was derailed by the spreading of the rails, and the engine and several cars were overturned. Five passengers injured.

17th, on Union Pacific, near Shoshone, Idaho, a freight train, consisting of engine and 13 cars loaded with coal, was thrown from the track by the spreading of the rails, wrecking it completely. Fireman killed and engineer hurt.

22d, on Louisville, New Albany & Chicago, near Lafayette, Ind., all the cars of a passenger train were thrown from the track by a broken rail and derailed, injuring 2 trainmen.

23d, on Northern Pacific, near Teanaway, Wash., a passenger train was derailed by the spreading of the rails, and 9 passengers were injured.

23d, on Union Pacific, near Viento, Ore., a freight train broke through a burning trestle and 12 cars loaded with stone were destroyed.

And 6 others on 5 roads, involving 1 passenger and 5 other trains.

##### DEFECTS OF EQUIPMENT.

5th, on New York, Lake Erie & Western, in the tunnel at Jersey City, N. J., a car of a freight train was derailed by the dropping of a brakebeam, and thrown over so as to foul the opposite main track in front of a freight train, badly damaging the engine and a number of cars. A fireman was slightly injured.

6th, on Pennsylvania, at Kinzers Station, Pa., 10 cars of a freight train were derailed and ditched by a loose wheel.

13th, on Northern Central, near Mahontongo, Pa., an axle broke under a car in a freight train and about 20 cars, including several oil tanks, were wrecked, caught fire and were destroyed.

20th, on Delaware, Lackawanna & Western, near Scranton, Pa., as a passenger train and a freight were passing on adjoining tracks a car in the freight was thrown over in front of the engine of the passenger train by the breaking of a truck, and considerable damage resulted.

22d, on Western North Carolina road, near Murphy, N. C., a wheel under the baggage car of a passenger train broke while descending a steep grade, derailling the entire train. An express messenger was killed and a postal clerk and 2 passengers were injured.

26th, 9 a. m., on Manhattan Elevated road, at Ninth avenue and 110th street, New York City, where the line is very sharply curved and the structure is about 60 ft. high, the engine of a passenger train was derailed by a broken truck. Several sleepers were torn up and fell to the street, injuring 2 pedestrians.

26th, on Cincinnati, New Orleans & Texas Pacific, near Falconer, Ky., caboose and 1 car of a freight train were derailed by a fallen brakebeam, injuring a brakeman and a trackman.

And 15 others on 14 roads, involving 3 passenger and 13 other trains.

##### NEGLIGENCE IN OPERATING.

9th, on the San Francisco & North Pacific, at San Rafael, Cal., a freight train ran into an open draw and was submerged in a creek.

9th, on Atchison, Topeka & Santa Fe, near Trinidad, Col., a stock train became unmanageable in descending a steep grade and was derailed at a curve. Sixteen cars were thrown over a high embankment, killing over 300 head of cattle. A brakeman was slightly injured. Three tramps stealing a ride were buried in the wreck.

9th, on Pittsburgh & Western, at Temple Station, Pa., an officers' train was derailed by a loose plank at a street crossing and went into the ditch. Two trainmen injured.

16th, on Atchison, Topeka & Santa Fe, near Telcot, N. M., as a construction train was crossing a bridge over the Rio Grande a pile driver on one of the cars became displaced and knocked down the bridge, the train going down with it.

18th, on Chicago, Milwaukee & St. Paul, near Milwaukee, Wis., a freight train was derailed and wrecked by a misplaced switch, injuring 3 trainmen. Trackmen had turned the switch for a hand car and had neglected to reset it for the main track.

And 10 others on 9 roads, involving 1 passenger and 10 other trains.

#### UNFORESEEN OBSTRUCTIONS.

1st, on Port Royal & Western North Carolina, near Laurence, Ga., a freight train ran into a land slide, derailling and damaging the engine. Engineer and fireman injured by jumping.

1st, on Central of New Jersey, near Port Morris, N. J., a freight train ran over a cow, and several cars, including the caboose, were derailed and wrecked. Two men riding in the caboose were injured.

7th, 1 a. m., on Texas & Pacific, near Pecos City, Tex., engine and baggage car of a passenger train were derailed at a point where rail fastenings had been maliciously removed. A tramp was badly injured.

10th, on Sinnemahoning Valley Railroad, near Moore's Run, Pa., a work train carrying a gang of men who were fighting forest fires was derailed at a point where the track had been warped by the heat, and several of the cars were thrown upon a pile of burning logs, killing 7 men, including the superintendent of the road.

13th, on Chicago, Milwaukee & St. Paul, near Viroqua, Wis., a freight train ran over a cow, and the forward portion of the train was derailed and wrecked. Engineer and fireman badly scalded.

17th, on Missouri Pacific, at Hall's Station, Mo., a freight train was derailed and partially wrecked at a washout. Fireman fatally scalded.

17th, 8:30 p. m., on Long Island road, at Greenvale, N. Y.,

#### OTHER ACCIDENTS.

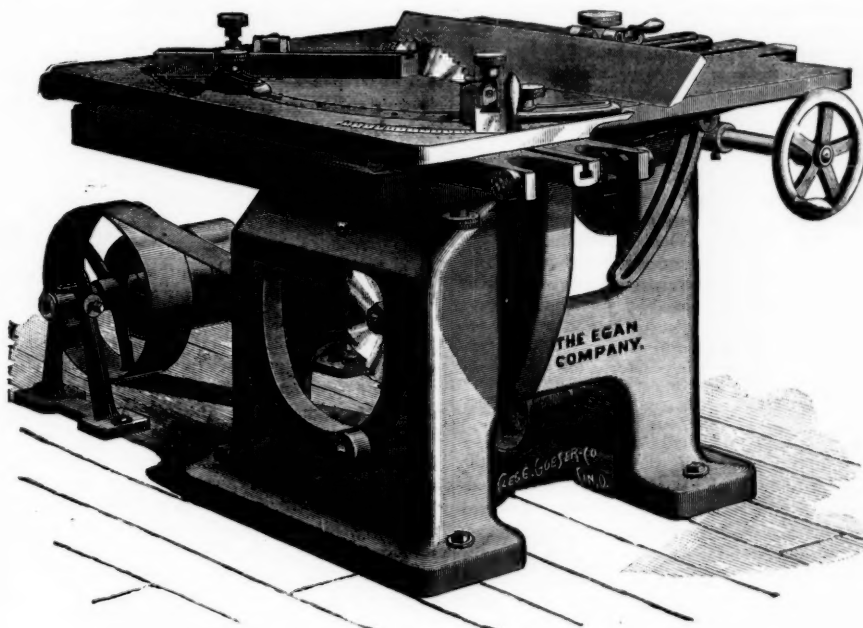
5th, afternoon, on Central of Georgia, 15 miles from Atlanta, Ga., a car of a passenger train was set on fire by the explosion of gasoline used in lighting the car. The car was cut loose from the train and burned up. A porter was severely burned.

11th, night, on Texas & Pacific, near Cypress, La., a passenger train was turned on to a spur track by a switch which had been maliciously misplaced and came near going off the end of the track into a river. The fireman jumped and was seriously injured.

11th, about 8 p. m., on West Shore road, near Little Ferry, N. J., the headlight and cab of the engine together with several windows in the cars of a passenger train were broken by the explosion of dynamite which had been maliciously placed upon the track.

16th, on Delaware & Hudson, near Jermyn, N. Y., the baggage car of a passenger train was found to be on fire, the flames starting, it is thought, from a spark lodging in the canvas steam-pipe protection underneath the car.

19th, on the New York Central & Hudson River, near Tarrytown, N. Y., a car of a construction train was blown to atoms by the explosion of a large quantity of Ajax powder, probably caused either by a spark from a locomotive of a laborer's pipe. Nineteen workmen are supposed to have been killed, some of them being blown into the Hudson River, and a number of others, together



Improved Double Rip and Cross-Cut Saw, with Tilting Table.

a passenger train consisting of engine and a combination car ran over a horse which had caught one of its hoofs between the main and the guard rails. The horse was thrown against a switch stand, turning the switch so that the car ran upon the side track. Both the engine and car were derailed and thrown over on their sides, the engine demolishing a frame station building. The engineer and a man riding on the engine were killed.

18th, on Chicago & Northwestern, near Nadeau, Mich., a fast freight train ran over a cow and 10 cars were derailed and wrecked. A brakeman was badly injured.

20th, on Chicago, Milwaukee & St. Paul, near Viroqua, Wis., a freight train ran over a cow and the engine and several cars were derailed and thrown over an embankment, seriously injuring engineer and fireman. A car containing live stock was burned up.

22d, on Lake Shore & Michigan Southern, at Butler, Ind., a sleeping-car of a passenger train was derailed by a mail bag which had not been thrown out far enough and got under the wheels of the train. The car was somewhat damaged and 1 passenger injured.

23d, on Texas & Pacific, near Van Horne, Tex., a freight train ran into a washout, wrecking the engine and 5 cars and killing a trainman.

23d, on St. Louis, Arkansas & Texas, near Jonesboro, Ark., a passenger train was derailed at a switch which had been maliciously obstructed, wrecking the engine and forward cars. The fireman and a man riding on the engine were killed and the engineer was badly scalded.

27th, on Denver & Rio Grande, near Salida, Colo., a freight train ran into a bowlder which had rolled down upon the track in a curved cutting. The engine and several cars were derailed and wrecked and 2 trainmen injured, one of them fatally.

29th, 11 p. m., on Illinois Central, near Centralia, Ill., the engine and 3 foremost cars of a passenger train were derailed and damaged at a point where rail fastenings had been maliciously removed. Engineer killed.

And 5 others on 5 roads, involving 3 passenger and 2 other trains.

#### UNEXPLAINED.

1st, on Utah Central, near Salt Lake City, Utah, a car of a passenger train was derailed and thrown over against a bank, injuring 3 passengers.

3d, on Union Pacific, at Omaha, Neb., an engine and 5 loaded cars of a freight train were derailed and wrecked, killing the engineer and injuring the fireman.

15th, on Long Island road, near Parkville, L. I., several cars of a passenger train were derailed and dragged some distance, when they broke away from the rest of the train. The derailed cars had open sides and transverse seats; they were crowded, and in the ensuing panic among the passengers to escape from them a half a dozen persons were injured, some of them severely.

16th, on Iron Railroad, near La Grange, O., the engine, one freight car and a coach of a mixed train were derailed at a curve and overturned down an embankment, injuring engineer and fireman and several passengers.

28th, on Illinois Central, at Champaign, Ill., the baggage car and one coach of a passenger train were derailed at a switch, the former being thrown against a freight train on an adjoining track and the other down an embankment, injuring a trainman and 4 passengers.

And 7 others on 6 roads, involving 7 other trains.

with the engineer and fireman, were badly injured. The windows of many houses in the vicinity were shattered by the explosion.

26th, on Central Pacific, near Floriston, Cal., an east-bound passenger train ran into a large bowlder which had fallen down upon the roadbed at the entrance to a tunnel, badly wrecking the forward part of the train.

27th on Baltimore & Ohio, near Grafton, W. Va., the coupling between the tender and first car of a freight train gave way, and the fireman was thrown upon the ground by the jerking of the engine and badly injured.

31st, on Union Pacific, at Kearney, Neb., a stone was thrown through one of the windows of a sleeping-car in a passenger train, fatally injuring a child.

And 11 others on 9 roads, involving 10 passenger trains and 1 other.

A summary will be found in another column.

#### Double Rip and Cross-Cut Saw.

The accompanying engraving shows a new double rip and cross-cut saw, for edging, ripping and cross cutting, designed for general use, and especially adapted for pattern-makers and for railroad shops. Its construction is very simple, and can be readily changed to suit the work desired. The column is one casting, with the saw mandrel arranged to revolve around a common centre inside the column, so that when the ripping saw is above the table the cut-off saw is below the table, and for grooving, either saw can be brought above the table is according to the depth of groove to be cut.

The table is of iron, made in two sections, both sections planed, and the one at the left of the saw made to work back and forth on rollers, for edging or cross-cutting. There are two miter fences for cutting right and left and one ripping fence, all accurately fitted to the table and in line with the saw.

The mandrels are of steel, running in self-oiling Babbitt-lined boxes, and driven by a countershaft placed clear of the column. This machine is made by the Egan Company, Cincinnati.

#### A Dredging Company.

The Hydraulic Dredging & Improvement Co. was incorporated last week under the laws of the State of New Jersey, the incorporators being Joseph W. Wilson, William N. Moland and Harold R. Lewis, of Philadelphia; Frank C. Somers, of Camden, N. J., and Louis A. Chandler, of East Orange.

#### Manitou & Pike's Peak Railroad.

The first passenger train over the entire length of this rack railroad ran to the Summit of Pike's Peak, June 30. It carried about 65 people, mostly excursionists from Denver. A slight snow squall was run through on the way up. The alignment, grade, construction and equipment of this road have all been quite fully described in the *Railroad Gazette*.





Published Every Friday,  
At 73 Broadway, New York.

#### EDITORIAL ANNOUNCEMENTS.

**Contributions.**—Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies in their management, particulars as to the business of the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and railroads, and suggestions as to its improvement. Discussions of subjects pertaining to ALL DEPARTMENTS of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.

**Advertisements.**—We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay, EXCEPT IN THE ADVERTISING COLUMNS. We give in our editorial columns OUR OWN opinions, and those only, and in our news columns present only such matter as we consider interesting, and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.

The table which we published last week, showing by companies and geographically the new railroad built in the first half of 1891, and the lines now under contract or located, will probably be slightly corrected within the next few weeks. So far the net correction amounts to 53 miles, making the total miles built in the United States 1,653. The total reported as under contract or located is only about 7,500 miles, a considerably smaller mileage than usual. To these last figures, however, we do not attach any statistical value. They are useful as indicating where work is likely to be done, but the facts accomplished never agree closely enough with the intentions expressed to make this part of the tables safe to reason from. Last week we made a comparative analysis of the new railroad building in five great groups of states, showing how the proportions built in each group have fluctuated in the last two and one-half years. The following shows approximately the percentage built in each group of states, according to Poor's division of the country. It gives a suggestion of the changes in local activity:

	1890.	Half 1891.
New England.....	1	1
Middle Atlantic.....	2	11
Central Northern.....	6	10
South Atlantic.....	10	35
Gulf and Miss. Valley.....	21	14
Southwestern.....	15	3
Northwestern.....	14	10
Pacific.....	20	14

One thing that will strike one in a study of the figures by states is the continued depression in those states in which legislation has been most unfavorable.

The true principle in all payments for service is to vary the compensation in accordance with the quality as well as the quantity of work done. This is a very difficult rule to apply in many kinds of railroad work, but it generally pays to try to apply it, and the *Railroad Gazette* has therefore given special prominence to the efforts of those managers who have taken hold of the task. Premiums for economical use of fuel and for excellent work in the track department have become well known. These can be paid under arrangements that are quite easily made, though the labor of adjusting a coal premium system to the new conditions that are almost constantly arising seems to have prevented the spread of that valuable means of saving money. In other departments the payment of either prizes or rewards has been found so nearly impracticable that few have attempted it; but there are isolated instances here and there, and it is one of these, that of the Fall Brook Coal Company, that is the occasion of this note, Superintendent Brown having just announced the fourth annual award of a \$60 premium to each freight conductor who has made an entirely satisfactory record for twelve months. Thirty-five conductors received the reward, out of 43 who had the opportunity to compete for it (all on the road who had been in service as conductors

a whole year). Mr. Brown's system of supervision and inspection is very carefully and thoroughly administered, so that the word "satisfactory" as applied to the men's records carries its full meaning, and indicates, not that 81 per cent. of the conductors were merely passable, making good records one year and poor the next, but that they performed their duties in a way that gave evidence of fairly constant attentiveness and intelligence. The management regards the money spent in this way as one of the best investments ever made in the operating department, and it is worthy the attention of every superintendent who can possibly spare the money to increase his conductors' pay five or ten per cent. It would be perfectly just and fair, of course, to reduce the regular rates five dollars a month, and use the money thus saved for paying the premiums at the end of the year, but we refrain from recommending such a revolutionary proceeding. But when those who know from experience are so positive in their praise of expenditures of this kind, why should not railroad directors generally break away from tradition, and appropriate money for an actual increase? It can never be proved that the amount is saved in diminution of wrecks and better time of trains, but yet the circumstantial evidence of such saving is as good as that relied on for many other expenditures.

The butting collision at Port Costa, Cal., June 15, referred to in our last issue, has been investigated by a coroner and some of the testimony is reported as below. It will be remembered that a gravel train was run out from a side track on the time of a passenger train, when both the conductor and engineer had just been reminded that the passenger train was due. Engineman Moore testified that he "was oiling his engine and heard a train go by on the other side and supposed it was the passenger train. Saw the switch open, and receiving a signal from the conductor, started out. Jordan [the brakeman who was killed] must have opened the switch on his own responsibility." Conductor Collins testified that he waved his hand to the engineer, meaning to signal that they were all right. \* \* \* "The engineer then pulled out. Both Collins and Moore frankly admit that it was their fault, and each one, while testifying, broke down, and it was pitiful to see them." While, so far as can be learned from this brief account, there must have been negligence in several inexplicable ways, there is one point which illustrates a common kind of carelessness and which deserves a word of notice, and that is the waving of the hand to indicate "all right." The conductor meant that the train was clear of the main track, and was therefore all right. The engineman understood that "all right" meant to start for the next station (or his destination). This carelessness as to the meaning of hand motions is well known to every one familiar with train handling, but no one seems to take any measures to stop it. The standard code is not only not enforced, but all sorts of other motions are permitted, some of them necessary and some not. It is true that the liability to fatal error is small, and we do not suppose that a sermon based on a text that comes up only once in 10 years (and then at the farther side of the country) will be received with the liveliest interest; but the hand signals used in American railroad yards ought to be thoroughly reformed, if only for the purpose of removing the evidence of slipshod ideas (and consequent lack of discipline) which the present practice gives. It is true that the man at Port Costa may have given a correct motion for a wrong purpose, but proper discipline would, while enforcing the use of the right signals in the right places, incidentally tend to stop the use of wrong signals everywhere.

The worst abused hand-motion is that shown in the standard code for Rule 59—"A motion crosswise with the track." The cut shows plainly enough that the motion of the arm is the essential feature of the signal (in the day time), but yet trainmen habitually make an entirely different signal, one in which the motion is made so as to be as nearly invisible as possible. The expert at this clumsy style of signaling extends his arm straight out horizontally, and then swings it around in a horizontal plane—precisely as he would do to wipe the dust off a high table with his sleeve. Ordinarily he will, at the beginning, point his hand away from the train, so that the engineman, if he be an expert and not too far away, can see that there is some slight motion up and down; but the up and down motion is not what the brakeman intends to give, by any means, for, if he could make exactly the motion he aims to make, it would be entirely unnoticed by the engineman 500 ft. away. But if this brakeman is specially perverse he faces toward the engine and extends his arm hori-

zontally and directly in front, so that the engineman gets just as good a view of it as one gets of the side of a car while standing on the track 20 rods ahead of the train, and no better. The engineman has to judge by the motion of the man's hand or fist, presenting a surface of 10 or 15 square inches, when he should have a semaphore, formed by the man's arm, presenting 75 or 100 square inches. The wrong motion for stop has come into use because the right motion for stopping is thought to conflict with the hand signal to go ahead—"a motion up and down." And if we were to judge by the picture published by the Time Convention this supposed conflict would be a real one; but that picture is wrong, as will be seen by reading Rule 60, which says that the lamp is to be raised and lowered vertically. The picture shows a motion which moves the lamp through the arc of a circle. Any one can see that to have the motion appear vertical to the engineman it must be made (if the man is facing toward the engine) by extending the arm in front of the body; and the day motion is to be made in the same way. It is true that this is a very poor day signal, but that is no excuse for playing topsy-turvy with the code. The correct go-ahead signal is shown in some rule-books—those of the Atchison, Topeka & Santa Fe, and the Boston, Revere Beach & Lynn, for instance. In trying to conform to the go-ahead picture in the standard code, trainmen simply extend their arms horizontally at right angles to the track, and then move their hands (and the arms very slightly) up and down. This comes very much nearer to the stop signal than it does to the true go-ahead signal, and it is not to be wondered at that men have come to have very little respect for the code signals. If the vertical motion is to be continued as a go-ahead signal for day use, trainmen ought to use a handkerchief or white flag, which would make it consistent with the night signal.

So much for the rules of the standard code. But, as we have intimated, the prohibition of improper signals of all kinds is an important kindred duty, and it is here to be noted that there are a good many signals outside the standard code which should not be prohibited, but should be systematized. There is no good reason why these should not be made uniform the same as the principal signals. They are necessary in every-day work, and any signal used in train work may become dangerous if wrongly given—or at any rate it is risky to assume that it would not be dangerous to take no cognizance of what the men are constantly doing. The signal to go ahead a short distance and that to start for the next station have to be different in practice; why not in the code? To set back "easy" so as to couple onto another car requires a different motion from that which signifies to back up an indefinite distance; these motions ought to be recognized and set forth in black and white. Testing air brakes is greatly facilitated by hand and lamp motions, but apparently no one has taken pains to find and prescribe the best method of making them. To cut off the engine, telling the engineman to call in a flagman and other communications are all the time made in various ways other than by word of mouth. A little attention to these points would be good in itself and would help to straighten out the crooked treatment now accorded the signals of the standard code.

#### Directors' Responsibility.

The jury system so often does worse than the law demands that it is a welcome relief when it does better. In the case of the President and Directors of the New York, New Haven & Hartford Railroad there can be no doubt that the verdict of the jury was the sensible one, independently of legal technicalities. Mr. Clark is a railroad man of the highest character and intelligence. There is no doubt of his good faith; and whatever difference of opinion there may be with regard to the practicability of steam heating, there can be no doubt that Mr. Clark knows a great deal more about the question than all the members of the New York Legislature put together. To have sent such a man to prison for refusing compliance with a law whose constitutionality was still under debate, and whose practical usefulness was far from proved, and which in one respect is certainly foolish, would have been the merest mockery of justice, and would have tended to bring the law itself into deserved contempt. The jury system usually prevents laws from being too good for the people who live under them; in this case it prevented them from being too bad for the people.

The case was substantially this. The New York, New Haven & Hartford Railroad had equipped its cars with the Baker heater. The New York Legislature passed a law requiring all roads more than 50 miles in length



to heat their passenger trains by means other than "a stove or furnace" in, or attached to, the car. The Baker heater in its perfected form gives a reasonable safety, and ruling it out is the respect in which the New York law is, as said above, certainly foolish. The New Haven road, which operates less than 50 miles within the New York State limits, was in no haste to comply. The tunnel collision challenged public attention to this failure; and although that accident was not directly connected with the violation of the act, which only requires steam heating on *passenger* trains, it led to the indictment of the President and the Directors of the road.

In his charge to the jury Judge Van Brunt gave no weight to the constitutional point raised by the company to the effect that, having less than fifty miles within state limits, it was not subject to the act. Nor did the question of direct responsibility for the tunnel disaster enter largely into the result as the law was presented by him to the jury. He charged them to acquit the Directors, because they could not be presumed to know all the details of the administration of the company, and could not be held criminally responsible for non-compliance with special laws where knowledge as well as criminal intent might be conspicuously absent. But these grounds of acquittal of the Directors thus stated left the case against the President all the stronger. He was the administrative head of the company; he knew what was going on and admitted that he knew it, and it must have been with no slight relief that he heard the verdict of acquittal pronounced in his case.

It must not be supposed that our approval of this verdict, or the public approval of it, rests simply on the character of the man involved. Were this so, it would be a defeat of justice. It rather rests on the character of the issue involved. It is a question whether the legislature shall have more and more irresponsible power in matters of which it knows little and cannot fairly represent the public interest. If the president or directors of a private corporation were held criminally responsible for failure to comply with legislative acts it would do away with one of the greatest safeguards against irresponsible legislation. Such liability on the part of the officials of a company would give them every inducement to yield even to the worst legislation, and no chance whatever to protect the rights of those whom they represent, even while the wisdom of such legislation was wholly untried. It would make the trustee almost necessarily false to the interests of those whom he represents. We all know how it works in the case of the tax laws; widows and orphans pay far more than their due share of taxes, because a failure to make exaggerated returns is in many of our states met by severe penalties against the trustee, and the latter gives himself the benefit of the doubt and sacrifices the trust funds to unjust assessments. The same thing would happen on a larger scale in the case of corporations if legislatures could enforce their unwise and arbitrary will by criminal penalties against the directors.

Of course it may be replied that the directors owe a higher duty to the public than to the stockholders. This is true in theory, and if legislatures were wise it would be true in practice; but as a matter of fact, legislatures are radically unwise. Over and over again they pass laws which involve great expense, little gain to any one and enormous indirect loss to progress in safety appliances. Such being the case, there is need of every expedient to check this arbitrary exercise of power. The better sense of the community must approve effective checks upon this irresponsible action in cases like the one before us, because the alternative is reckless over-legislation.

In the constitutional history of England in past centuries the jury system did great service in checking the irresponsible power of the king. The difference in the histories of France and England was to a great extent due to the fact that in the latter country the juries had power to nullify a law which did not suit them, while in France the judges had to take it as they found it. The technical powers of the sovereign in England were subject to useful, practical checks at almost every point. To-day the tyranny which we have to fear is the tyranny of legislatures. While the judges can exercise some restraint upon such tyranny, their powers are, after all, limited, especially in dealing with police regulations. In such cases the jury system may furnish the same kind of protection against the tyranny of the legislature that it once did against the tyranny of the sovereign. It is at least a comfort to reflect that, although juries frequently make fools of themselves when the law is wise, there may be instances where juries will prove themselves wise when legislators have made fools of themselves.

#### Cost of Service and Railroad Rates.

We publish elsewhere an article by Mr. S. Y. McNair, showing the relations between revenue and cost for different kinds of traffic, on different groups of railroads. The figures which he gives are of great interest, and are calculated to do away with the belief that Western passenger rates are unduly high. Making the distribution of fixed charges on the basis adopted by the Interstate Commerce Commission he shows that Western passenger business at present rates and in present density often results in a deficit instead of a profit.

However great the interest of these figures, we cannot agree with the principle on which they are arranged, nor with the deductions with regard to railroad economy and railroad policy which would result from the adoption of this principle. The author undertakes to divide maintenance expenses and interest between the different traffic departments by an arbitrary rule. To ascertain the cost of handling a passenger or a ton of freight he would divide all items of expense under certain fixed rules, and would decide what was a just and fair rate on the basis of such division. This looks well enough until you try to carry it out; not afterward. The attempt to make all traffic pay an equal or fair share of the fixed charges involves killing all the traffic which cannot pay this share. Put up passenger rates, carry fewer passengers, run fewer trains, and you apparently make the distribution between freight and passenger business fairer; but really you have put a burden on the community without corresponding gain to the railroads.

It is wholly impossible to tell what is a fair or just rate, unless you know what would be the effect upon volume of traffic of a reduction in such a rate. If 25 cents a hundred pounds is sufficient to kill the wheat traffic, and 20 cents a hundred pounds will allow large shipments, the 20-cent rate may be much more profitable to the railroads than the 25-cent rate. If the direct cost of handling wheat is only 15 cents a 20-cent rate on large traffic is better than a 25-cent rate on small traffic, no matter what the Interstate Commerce Commission or Mr. McNair may figure out as to the just distribution of fixed charges. Nor does this reduction from 25 cents to 20 result in putting an increased burden upon passengers or upon shippers of other kinds of freight. It lessens the burden rather than increases it, because it results indirectly in the improvement of railroad facilities, and this always tends in the long run to lower rates.

Suppose that it cost a railroad 50 cents a mile to run a passenger train, for fuel, train service and other items of direct expense, independent of maintenance and interest. If a railroad by charging 2 cents a mile can get 50 passengers for this train, while if it charges 2½ cents a mile it can only get 30 passengers, the 2-cent rate pays the railroad better. If the figuring shows that it pays the railroad worse, so much the worse for the figuring. This is an inherent fault of all attempts to apportion fixed charges in rate determination. Those who advocate it commit precisely the error in which the socialists involve themselves in reasoning about just distribution of profits. In trying to have the burdens of society equally borne and the profit equally divided, they devise schemes which would result in leaving no profit at all for anybody, and increasing everybody's burdens. The attempt to base rates on cost of service has actually resulted in high charges and lessened railroad development, just as the mediæval attempts to run society on socialistic principles resulted in hard work and no pay.

A railroad rate really consists of two parts: one to cover the direct cost of handling and moving the goods, which can be and should be based on the distributed items of expense; another, which is of the nature of a tax, by which each shipment is made to contribute what it can toward maintenance, interest and profits. The latter is primarily based on the value of the goods. The differences in rates for different articles are chiefly due to the second element rather than to the first. The tax which the article can bear is usually determined by a process of experiment. If lowering rates increases shipments, it shows that a high rate was a burden. As long as the rate leaves sufficient margin above direct cost, a reduction is made where it will increase the volume of traffic. If the direct cost of a shipment is 15 cents, and a reduction of the rate from 25 cents to 20 cents will more than double traffic, the railroad manager will make it. He does not take fixed charges into account, and he ought not to. He simply sees whether there will be an increase in gross earnings resulting from the change that will more than balance the increase in operating expenses. If it will, it is good policy to make it. Even if passenger rates now

pay less than their share of fixed charges, a further reduction may be desirable in cases where the volume will so increase that larger revenues can be obtained without corresponding increase in operating expenses. Experience alone can decide whether such is the case.

If this method of rate making is intelligently carried out, it furnishes a pretty fair system of taxation. Unfortunately, it is not always carried out with either fairness or intelligence; and in view of mistakes which have been made it is natural that some should go to the opposite extreme and try to take the element of taxation entirely out of rate making, basing every thing on cost of service. We greatly regret this tendency. There is nothing which is more disastrous than to try to remedy the bad application of a good principle by substituting a bad principle in its stead; it throws matters into confusion and tends to delay real reform indefinitely. We believe that the method of rate making adopted by railroad agents, however badly misapplied, is in principle the correct one, and that progress is to be sought by enforced publicity in the application of this method and by equality of charge in cases which are clearly alike, rather than by any attempt at artificial distribution of fixed charges between classes of traffic which are clearly different. Let the traffic manager make every rate cover the direct expense and something more. If the volume of traffic is killed by a high rate, let him make his money by doing a large traffic at a narrow margin first in cheap goods, while in more valuable goods he makes a similar profit by doing a smaller traffic with a wider margin. Passenger rates and freight rates are, and must be, determined independently. In a populous country passengers will pay a larger share of the fixed charges and profits under almost any rate system; in a thinly peopled country the railroad may have to carry passengers at rates which will barely pay the direct expenses, and trust for its profit to the fact that the efficiency of labor in a new country makes each man furnish a larger amount of freight to the railroads and pay a larger margin of profit upon that freight.

It often happens that a railroad, in its desire to develop industry and establish factories along its line, will carry coal for rates which little more than pay the direct cost. Frequently this is wise policy. The low coal rates develop business which high rates would inevitably prevent, and this business once developed furnishes the railroad with higher class traffic in both directions, for producers and for consumers. In like manner, the passenger rates in a new country must often be made so low as to leave no profit. It may be desirable to make them less than the direct expenses of the traffic. It quite generally is desirable to bring them down pretty near to that limit. The attempt to make the passenger business pay the interest on the cost of the railroad would be simply suicidal; that, if paid at, all must be paid for by freight. If the encouragement of travel by low rates will increase the freight, it at once lessens the burden to the community and increases the profits of the railroad. To the fact that this system has been pursued in the past we owe a large part of the settlement and development of our Western country. A system which might do for Europe, where population is dense and business conditions stable, can hardly be applied to the needs of a growing nation; it would partly fail in the East, and it would be disastrous in the West.

#### May Accidents.

Our record of train accidents in May, given in this number, includes 67 collisions, 80 derailments and 19 other accidents, a total of 166 accidents, in which 63 persons were killed and 156 injured. The detailed list printed on another page contains accounts of only the more important of these accidents. All which cause no deaths or injuries to persons are omitted, except where the circumstances of the accident as reported make it of special interest.

These accidents are classified as follows:

<b>COLLISIONS:</b>		
Rear.....	33	
Butting.....	18	
Crossing and miscellaneous.....	16	
		— 67
<b>DERAILMENTS:</b>		
Broken rail.....	2	Open draw..... 1
Loose or spread rail.....	6	Track repairers..... 1
Defective bridge or culvert.....	2	Bad loading..... 1
Defective frog.....	1	Animals on track..... 5
Broken wheel.....	5	Landslide..... 2
Broken axle.....	4	Washout..... 2
Broken truck.....	4	Malicious obstruction..... 6
Fallen brakebeam.....	4	Accidental obstruction..... 2
Broken coupling.....	4	Purposely misplaced switch..... 1
Loose wheel.....	1	Fire..... 1
Misplaced switch.....	6	Unexplained..... 13
Runaway train.....	1	
Careless running.....	5	
		80
<b>OTHER ACCIDENTS:</b>		
Cylinder explosion.....	3	
Broken side rod.....	2	
Car burned while running.....	3	
Various breakages of rolling stock.....	4	
Other causes.....	7	— 19
<b>Total number of accidents.....</b>		<b>166</b>



The causes of collisions, where given, were as follows:

	Rear.	But- ting.	Crossing and other.	Total.
Trains breaking in two.....	4	1	2	7
Misplaced switch.....	4	1	2	7
Failure to give or observe signal.....	5	1	2	8
Mistake in giving or understand- ing orders.....	3	3	4	10
Miscellaneous.....	8	3	4	15
Unexplained.....	12	11	8	31
Total.....	33	18	16	67

A general classification shows:

	Col- lisions.	Derail- ments.	Other Accidents.	Total.	P.c.
Defects of road.....	11	11	11	33	7
Defects of equipment.....	5	22	10	37	23
Negligence in operating.....	29	15	4	48	28
Unforeseen obstructions and maliciousness.....	2	19	5	26	15
Unexplained.....	31	13	4	48	27
Total.....	67	80	19	166	100

The number of trains involved is as follows:

	Collisions.	Derail- ments.	Other Accidents.	Total.
Passenger.....	25	23	13	61
Freight and other.....	104	61	3	168
Total.....	129	84	16	229

The casualties may be divided as follows:

	Collisions.	Derail- ments.	Other Accidents.	Total.
<b>KILLED.</b>				
Employees.....	19	16	19	54
Passengers.....	1	1	1	3
Others.....	3	4	1	8
Total.....	23	21	21	65
<b>INJURED.</b>				
Employees.....	60	29	9	98
Passengers.....	17	33	1	51
Others.....	5	3	1	9
Total.....	82	65	11	158

The casualties to passengers and employees, when divided according to classes of causes, appear as follows:

	Pass. killed.	Pass. injured.	Emp. killed.	Emp. injured.
Defects of road.....	11	14	1	3
Defects of equipment.....	1	6	1	5
Negligence in operating.....	13	13	37	73
Unforeseen obstructions and maliciousness.....	1	1	14	13
Unexplained.....	1	16	1	4
Total.....	2	50	54	98

Twenty-nine accidents caused the death of one or more persons each, and 42 caused injury but not death, leaving 95 (57 per cent. of the whole) which caused no personal injury worthy of record.

The comparison with May of the previous four years shows:

	1891.	1890.	1889.	1888.	1887.
Collisions.....	67	68	45	63	35
Derailments.....	80	59	54	75	43
Other accidents.....	19	5	3	7	5
Total.....	166	129	102	145	83
Employees killed.....	54	43	23	23	16
Others.....	9	22	29	20	15
Employees injured.....	98	102	84	59	40
Others.....	34	38	68	99	33
Passenger trains involved.....	64	42	36	37	30

Average per day:

	1891.	1890.	1889.	1888.	1887.
Accidents.....	5.35	4.16	3.29	4.68	2.68
Killed.....	2.03	2.10	1.68	1.40	1.00
Injured.....	5.03	4.52	4.90	5.09	2.35

Average per accident:

	1891.	1890.	1889.	1888.	1887.
Killed.....	0.379	0.504	0.510	0.296	0.373
Injured.....	0.939	1.085	1.490	1.089	0.879

The worst two train accidents in May were those at Moore's Run, Pa., on the 10th, and at Tarrytown, N. Y., on the 19th. It will be remembered that the former resulted from a forest fire and the latter from an explosion of dynamite. Little is known about the precise cause in either case, and, as we have before remarked, they are included in this record because they affect railroad trains and not because they have any special lesson for railroad superintendents more than for other people.

We have reports of only two passengers killed in May, which is, however, two more than the record for April. Both of these fatalities were attended by unusual circumstances. The girl killed at Kearney, Neb., on the 31st was the victim of a cause which is felt on most large roads every week, but which seldom results so seriously. The cold-hearted statistician doubtless can present plausible arguments for the belief that the devilry of boys and tramps causes no more broken windows per train mile now than it did in former years, but the large number of such cases reported nowadays nevertheless suggests, in a forcible manner, the need of a little more absolutism in American municipal government. Lawless persons stone passenger trains just because they find that the crime is not punished, and the lack of punishment comes largely from the general prevalence of free-and-easy habits among well-nigh all classes.

The soldier killed at Borden, Tex., on the 21st, was riding in the baggage car, as custodian of the baggage belonging to his company, and the violent displacement of the baggage is said to have been the immediate cause of his death. This Borden accident is classed under the head of defects of equipment, as the train parted on account of a defective coupling; but the disastrous result was chiefly owing to the brake failing to act, which the trainmen say was or account of malicious interference. Similar tampering, attributed to tramps who were stealing a ride, is reported as the cause of a collision at Huntington, Ind., on the 17th. We fear that some suspicious people will demand very particular proof before fully accepting these explanations.

At Fort Jennings, on the Toledo, St. Louis & Kansas City, on the 19th, a number of men engaged in unloading a threshing machine left a piece of timber projecting

over the main track, which, being struck by a passing train, was thrown around so as to strike the men, killing three of them and injuring several others.

On the Canadian Pacific, at Straight Lake, Ont., May 9, a passenger train was wrecked by running upon a burning trestle and one passenger was killed. If reports are correct, this is the first passenger ever killed in a train accident on the Canadian Pacific. There was a serious rear collision of cable cars in the Washington Street Tunnel, in Chicago, on the 20th, in which a number of persons were injured and the track was blocked several hours. An electric street car at Toledo ran into a freight train of the Lake Shore & Michigan Southern on the 22d, shaking up the passengers, but doing no serious personal injury, so far as the reports indicate.

In the last issue of *Bradstreet's* appears a letter from Mr. Edward Atkinson, under the title, "Why Trade is Dull." He says:

"The largest consumption of iron in ratio to population ever known and the heaviest railroad traffic ever conceived of mark the record of the year 1890. . . . With large crops fully assured in 1891 and better conditions promising great abundance, we witness at the present time great fluctuations in the rate of interest, vague fears of disaster and a very great want of activity and enterprise, with a partial paralysis, especially in sound and safe enterprises, in the South and Southwest."

He gives the following advance figures from *Poor's Manual* showing the railroad business for 1890 as compared with 1889:

	1889.	1890.	Inc.	per cent.
Miles of railroad operated.....	152,689	157,976	5,287	3.40
Freight, tons.....	619,137,237	701,344,437	82,207,200	13.28
Freight, tons 1 mile.....	68,604,012.396	79,192,985.125	10,588,972.729	15.42
Passengers carried.....	495,124,767	520,439,087	25,314,320	5.13
Passengers carried 1 mile.....	11,985,726.015	12,521,165.619	535,439.604	4.73
Earnings from freight.....	\$666,530,563	\$740,374,844	\$73,844,280	11.08
Earnings from passengers.....	\$259,620,307	\$273,644,439	\$14,024,132	5.41
Miscellaneous earnings.....	\$66,685,396	\$72,000,924	\$5,315,528	8.00
Total gross earnings.....	\$992,836,266	\$1,086,020,207	\$93,183,941	9.40
Net earnings.....	\$518,125,339	\$541,666,369	\$23,541,030	7.40
Earnings per ton per mile.....	0.976c.	0.934c.	*0.042c.	*4.30

\*Decrease.

"One may find in these figures proof of the existence of such an abundance of product as to readily explain the ease with which this country has met the wholly abnormal demand for gold coin during the past few months. With the proceeds of this abundance, which is indicated by the railroad traffic, we have been able to buy all the securities which our foreign correspondents have been obliged to sell in order to meet the real disasters which have come upon them, and at the same time, in place of a scarcity of gold coin, our enormous supply of gold has enabled us to spare \$50,000,000 to \$60,000,000 worth without any serious inconvenience."

Mr. Atkinson speaks of the prosperity and high credit of the South and concludes, finally, that the chief cause of the present depression is the "continued coinage of silver dollars, so called, which are worth only about 75 cents," and the danger of further legislation in the same direction. That Mr. Atkinson has pointed out one of the main causes if not the main cause of existing depression we do not doubt, but what is of especial interest in his letter is, first, the fact that freight ton-miles increased 15.4 per cent. in 1890 over 1889, and that the rate per ton per mile fell from 0.976 to 0.934 cent; and second, the fact that the volume of traffic was so great that, in spite of the serious decline in the average rate, net earnings actually increased, and increased 7.4 per cent. We are now in the fourth year of freight rates less than one cent per ton-mile. The rate for a series of years has been.

	1884.	1885.	1886.	1887.	1888.	1889.	1890.
	1.124.	1.057.	1.042.	1.031.	0.977.	0.976.	0.934.

The decline, it will be observed, has been uninterrupted and in two years it was greater, absolutely and relatively, than it was last year. In 1885 the fall was almost 6 per cent; in 1888 it was 5.5 per cent and last year it was 4.3 per cent.

The scheme for insuring railroads by the year for losses resulting from damage to rolling stock by collisions and derailments, which was started two years ago and was mentioned in the *Railroad Gazette* at that time, was reported some weeks ago to have ignominiously failed. We understand that the roads which made contracts for a year have not renewed them, and that no new ones are being made. The trouble seems to have been that the presidents and directors did not fully realize what a serious matter the accident expense account really is. There is no complaint that superintendents became reckless when they found a collision would not increase their expense account for the year, but the financial officer far removed from the practical operations of train running felt perfectly sure at the end of the first year that, whatever experience or the laws of probability might teach concerning other roads, or railroads in general, as to his line everything had been reformed, and in the future he was sure that there would be no such big items of expense as had shown themselves in the past. This, of course, made him unwilling to pay a reasonable price for the insurance, and so the insurer's enthusiasm gave out. Meantime the accident record will probably not be much better this year than last. The insurance men who made this experiment in railroading found a very

much smaller expense per train mile for accidents on some roads than on others, but there were in every case good reasons for the difference.

Massachusetts has always aimed to be "just a little" in advance of the foremost ranks in the march of civilization, and in railroad regulation has quite fully realized her aim. But the last legislature went a step beyond even the refinements of Boston superlativeness and empowered the Railroad Commissioners to require a signal at crossings where a highway runs beneath the railroad. This cannot be intended to prevent people being killed by the cars, but is evidently a scheme of some one who fears that he or his horse will some time be scared to death. It is true that horses take fright at engines above them as well as in other situations, and the two-years' discussion at Springfield between those who wanted a high parapet on the five-track bridge over Main street and those who didn't showed that a great many horse-owners are densely ignorant as to the best means of promoting safety at under-bridges; but if people generally do not know that the simple way is to train their horses to not fear an engine or train it would perhaps be best for the railroads to buy up all the horses in the surrounding country and train them. An automatic audible signal is doubtless what the promoters of this law have in mind, and as a reliable device of this kind costs over \$500 to put in, the training scheme would very likely be the cheapest way out. We have not taken out a patent upon it.

The term of Railroad Commissioner Crocker, of Massachusetts, is about to expire, and the Governor has nominated a new man for the place, Chauncey Smith, of Cambridge, a patent lawyer "versed in mechanical and electrical matters." We do not know the Governor's reason for dropping Mr. Crocker, but the act is to be regretted, however good a mechanical expert or lawyer the new man may be. Nine-tenths of the special qualifications for this office have to be learned by experience, and Mr. Crocker has faithfully applied himself to the task during his four years' incumbency. He has ably filled the chairmanship, and has in fact been the main stay of the Board. He is doubtless better equipped for his position than any other state railroad commissioner in the United States, and will be greatly missed in the national conventions of railroad commissioners. And it is to be noted in passing that the theory of the constitution of the Board—a lawyer, a business man and an engineer—does not require a mechanical or electrical expert for the first member; the third man should be the one to furnish that kind of knowledge, while the first should be of a judicial mind as well as with some legal training, to deal with the broad questions that come before the board.

Recent very high water in the Colorado River has been followed by a remarkable phenomenon. One of the old lake beds on the line of the Southern Pacific in the lower valley has been flooded to the extent of 12 x 30 miles, and to an average depth of 21 inches. The communication between this lake and the river has not been found, if it exists. It may be subterranean from the "sink of the desert," or it may be overland at some point not yet observed. At any rate it is probable that the new lake will quickly disappear by evaporation and seepage, as the waters in the river subside.

#### NEW PUBLICATIONS.

*The Cleaning and Sewerage of Cities.* By R. Baumeister, Professor at the Technical Institute of Karlsruhe. Adapted from the German by John M. Gooddell. New York: Engineering News Publishing Company. 1891. Pages vi + 284, with index and numerous illustrations.

The three parts into which this excellent little work is divided are Sewerage, the Purification of Sewage, and General Municipal and Domestic Sanitation. It has an appendix on American practice in street cleaning and sewerage, and another one on diagrams of hydraulic formulas. Mr. Rudolph Hering has written an introduction, which is as good a review as can be made of the book, and therefore we confine our notice to a few extracts from that. Mr. Hering explains that as the book is written primarily for German engineers it is in some cases not applicable to American practice, and he points out those cases. In the main, however, the book is one which American engineers will find valuable. Concerning it Mr. Hering says:

The author is well versed in the subject, though not a practicing engineer. His object has been to present in a compact form the elementary principles which govern all the essential parts of a design, and to confine himself to the usual practical questions, rather than to dilate on the more intricate problems which occasionally arise. His impartiality, characteristic thoroughness and judicial temper have fitted him to present the subject-matter concerning which all controversy has not yet ceased in a more balanced and scientific form than I have seen in any other book. We can therefore credit this work with the additional merit of tending to restrain any reader from plunging headlong into theories and practices which, both in Europe and America, are occasionally advocated by parties who fail to see all sides of the subject, or who are biased in the direction of their personal interests. . . . The chapter on the shape of sewers describes more completely than I believe is found in any single publication the characteristic forms for various conditions occurring in practice. The chapter pertaining to the methods for the calculation of sizes embodies the latest and best formulas and convenient diagrams to facilitate the necessary computations.

The details of construction, such as manholes, lamp-



holes, junctions, overflows, siphons and outlets, are quite fully treated and well illustrated, with a view to showing the proper variation in the designs for different conditions. The details are applicable and many will be equally serviceable in American practice. The remarks on relief outlets or stormwater overflows are particularly useful.

Flushing and ventilation are subjects which as yet have received insufficient attention in America, particularly in those of our cities having combined systems of sewerage; the many suggestions of Prof. Baumeister will therefore be of special value.

The second part of the work pertains to the purification of sewage. At the present day there is published probably nowhere else, within the same short space here devoted to it, a more complete and rational account of this subject. . . . The chapters on chemical precipitation contain a good deal of matter with which American readers have not as yet been made familiar, particularly in regard to the smaller plants as used in Germany. The annual cost of precipitation ranges from 11 to 24 cents per capita, but it is not safe to estimate on these figures in this country.

*The Interstate Commerce Law.*—The July issue of *The Forum* contains an excellent article, by Mr. Aldace F. Walker, on the Operation of the Interstate Commerce Law. The article is so clear and comprehensive that it will be valuable to those who have only a vague notion of the origin of the law and what it has accomplished, and it may be read with profit by many who have kept close watch of the progress of events under the law.

Mr. Walker reviews briefly the influences which led to the enactment of the law and the results which have followed it. The principal objects sought were not reduction of rates, which fell already with sufficient rapidity under the influences of competition, but uniformity of rates and the prevention of discrimination. Mr. Walker shows that the operation of the law has been followed by reduction of rates, to the injury of the railroad companies and to the very questionable advantage of the public; and that further it has not done away with discrimination, rate wars and violent fluctuations. He is a believer in the fundamental principles of the law and in the propriety of federal legislation for the regulation of railroads, but from what has been said it is clear that he believes also that the law must be very materially modified.

#### TRADE CATALOGUES.

*Electric Tramways for Mills and Manufactories.*—The Thomson-Houston Motor Company, 620 Atlantic Avenue, Boston, Mass., has issued a small pamphlet describing that company's system of electric tramways for mills and factories. The special advantages claimed for electricity for such situations are three, viz., safety, the removal of the obstacles presented by grades, and economy. These lines may be run through mills and storehouses without affecting the insurance rates, while grades of 12% may be surmounted by them. The pamphlet illustrates and describes, very briefly indeed, tramways in various mills. Half a dozen installations are shown. These vary in length from a few hundred feet up to one mile, and in gauge from 36 in. up to 9 ft. 10 in. The adaptability of this system for mill and yard work will doubtless make it very popular.

#### Western Floods.

CHICAGO, June 30, 1891.

The very heavy rains which last week extended over a considerable area through the western and northwestern portions of Iowa and across Nebraska and even into Colorado to within perhaps one or two hundred miles of Denver, caused extensive damage to a number of the large western roads. The inundations of the tracks and entire destruction of bridges, with the consequent stoppage of all traffic for days together on the main lines, have, in connection with the fact that the wires have been down, in many cases cut off all communication and left the officers with but little knowledge of outlying districts.

Iowa suffered the worst. Up to this afternoon the Illinois Central has had no trains running into Cherokee, Ia., from the East, as the Howe truss bridge, about one-half mile from the town, together with several hundred feet of trestle and a long stretch of track, were completely washed away. This company's line north to Sheldon sustained but slight damage, so that it was quickly repaired and trains run from the main line up to Sheldon and down to Le Mars on the C., St. P., M. & O. line. This bridge has now been temporarily repaired. West of Cherokee the pile bridges have been washed out and the track so much destroyed as to take a longer time to repair; likewise the track on the branch to Onawa is carried away at places and the pile bridges gone.

The iron bridges have sustained but little damage, as far as can be learned, but owing to the character of the soil in that section it is impossible to state at this writing whether or no there may not have occurred considerable scouring. This effect cannot be determined until the subsidence of the flood. The first 12 miles of track west of Cherokee was more or less damaged for its entire length.

The Chicago & Northwestern had a stoppage of trains on the Merville line between Merville and Galva, on the Omaha line south of Ida Grove, and on the Northern Iowa main line from Peterson to Granville. This road has lost the use of three branches, and it will take nearly a week yet to make the damage good. In one instance a bridge on this line was washed 14 miles down the river and was found covered up in a mud bank.

On the Chicago, Milwaukee & St. Paul at Maple River, Ia., the Howe truss bridge was carried away, and a large part of the approach is completely gone. This has been cribbed up and much progress has been made toward getting the line into running order. There was about 4 ft. of water over the original height of bank at this point. Near Hornick there was over a mile of track washed off into the ditch and covered entirely with mud, while from that point to Hedges there is about 3 ft. of water over the rails. Passenger trains were caught at Hornick with inundations ahead and behind, tying them up for five days. Through these valleys the water rose at the rate of one-half inch per minute and continued up to the tops of the telegraph poles in many instances. Near Hornick the track was 8 ft. under water for some distance. Along the Little Sioux River the water rose 30 in. higher than has been known at any time for the last 24 years. The Floyd River at Le Mars rose 15 ft. higher than ever known before.

The damage on the Burlington road through Nebraska was confined to the lines at the north mostly. There was a bad washout on the Alliance branch which wrecked a stock train of 23 cars, burying the cars and stock indiscriminately in the mud. The engineer and fireman were reported killed and the brakemen seriously injured. With this exception there have been no fatal accidents on railroads as far as heard from. This road, on account of its complete network of lines through this state, has been able without much difficulty to run trains around the flooded sections with but slight delays.

The Fremont, Elkhorn & Missouri Valley line from Lincoln north has been blocked and considerable damage done to the track.

As for the damage to the towns, many of them have been covered from 4 to 8 ft. with water, and in some instances the houses and stables carried for miles down streams, to say nothing of losses of large herds of cattle and sheep. The stock was in some cases loaded into cars and hauled into adjoining counties, but usually where high ground was available the animals were driven out of the bottoms, although many times they became surrounded by the rapidly rising water, and were carried off their feet. Much damage was done to the stock by being brought in contact with the ever present barbed wire fences, in which they became tangled up and their hides badly torn.

The inhabitants of Cherokee were left homeless and the Mayor has called on the Governor for assistance. Omaha was flooded all through the lower section of the town. For some time there were no trains either in or out of the city.

Damage in the cities consists principally in the loosening of pavements and filling of cellars. The electric cars are stopped, and the cable lines cannot operate from their wells filling with mud and silt, which necessitates digging out where the road runs through a hollow and is improperly drained.

The electric cars were stopped chiefly by the intense electric disturbances in the atmosphere, and the trolleys were pulled down to avoid damage.

The Iowa storm centered at Cherokee, but the extent of damage to crops will not prove as great as at first estimated. The corn was knocked down badly, but much of it will probably rise again. Around Aurelia the injury to the crops ranges from 5 to 10 per cent. Most of the road bridges there have been carried away, so that farmers are unable to come into the towns and report details of the destruction. Hay seems to have suffered most. A conservative estimate will probably show less than five per cent. damage across these Iowa counties. Stories concerning floating farmers and migrating barnyards are of course rife, and the losses will undoubtedly foot up many hundreds of thousands, but the storm area is after all comparatively small, and will not affect materially the general railroad traffic for the year, or the price of cereals.

#### Railroad Legislation in Massachusetts in 1891.

Besides the amendments to the law for the abolition of grade crossings mentioned in the *Railroad Gazette* of May 8, chapter 262 of the Acts of 1891 authorizes the Governor and Council to initiate, after a hearing of parties in interest, through the Attorney-General, proceedings for the abolition of a highway grade crossing, by petition to the Superior Court, so that now the parties who may take action are: (1) The municipal authorities of a city or town in which the grade crossing is situated, (2) the directors of the railroad company, and (3) the Governor and Council. Other railroad legislation in Massachusetts is as follows: Chapter 129 provides for such signals, automatic or otherwise, as the Board of Railroad Commissioners may require, to give notice of the approach of a train at a crossing of a railroad above a highway. Chapter 204 authorizes the Railroad Commissioners, after notice to the railroad company and a public hearing, to recommend changes in the manner of making up and shifting freight trains and the sounding of whistles. Chapter 249 provides that it shall not be lawful after Nov. 1, 1891, to heat passenger cars by a stove or furnace inside or suspended from the car; provided that the Railroad Commissioners may grant such exemptions as may seem necessary or reasonable. The penalty for violation of this law is a fine of \$500.

Resolves were passed requiring the Railroad Commis-

sioners to investigate the zone system of passenger fares, and report whether "said system or any modification thereof can be adopted with advantage under the conditions prevailing in this Commonwealth;" also requiring the Railroad Commissioners to collect statistics and inquire into the subject of pensioning railroad employees injured in the discharge of their duty; also, requiring the Commissioners to inquire into the practice of the various roads as to the number of brakemen employed on freight trains, and to make such recommendations as the safety of traffic and human life may require.

#### TECHNICAL.

##### Manufacturing and Business.

The annual meeting of the Morse Twist Drill & Machine Co., of New Bedford, Mass., was held recently, and the following officers were re-elected: President and Treasurer, Edward S. Taber; Clerk, Gilbert Allen; and Directors, Nathan Chase, F. S. Allen, F. M. Stetson, A. G. Pierce, Gilbert Allen and E. S. Taber.

The Middleton Car Spring Co., of Philadelphia, is soon to remove its plant to Harvey, Ill., near Chicago, and will occupy a tract of eight acres north of 155th street. This company has a capital stock of \$100,000. The officers are: William J. Watson, President; Nathan Middleton, of Philadelphia, Vice-President, and James B. Quirk, Secretary and Treasurer.

The Walker Mfg. Co., of Cleveland, O., is erecting new works which are rapidly nearing completion. The machine shop will be 165 ft. wide. The foundry building is to be 118 ft. wide by 300 ft. long, equipped with two 30-ton, two 12-ton and two 6-ton improved rope-drive power traveling cranes.

The American Pneumatic Gate Co., of Chicago, has been incorporated by Frank O. Lowden, Louis Shissler and Emory S. Walker. The company will manufacture pneumatic gates for crossings.

H. C. Thomas, Secretary of the Norwood Car Replacer Co., of Baltimore, Md., states that the company has made arrangements for the erection of a plant at Norfolk, Va., to manufacture its patent car replacer.

The Botsford Steam Car Heating Co. will soon complete the removal of its works to South Akron, O. The plant is to consist of two buildings, one a brick structure 100 x 300, two stories high, and a frame building 46 x 60. The company will manufacture brass goods, car heating appliances, boilers for house-heating purposes, railroad cattle guards, railroad and gray iron castings.

The Huntingdon Mfg. Co., at Huntingdon, Pa., which is controlled by the Iron Car Equipment Co., of New York, has indefinitely suspended operations, throwing out of employment 350 men. The suspension is due to a lack of orders for cars. It is rumored that the plant will be removed to Tennessee.

At the annual meeting of the Harris Palatial Car Co. at Portland, Me., the following Directors were elected: Edwin F. Perkins, Louie J. Harris, Charles J. Seymour, Alfred T. Ackert, Luther M. Harris. The officers elected are: President, Edward F. Perkins; Vice-President and General Manager, Louie J. Harris; Treasurer, Charles J. Seymour; Secretary, Luther M. Harris. The company promises that five more cars will be built the coming year at a cost of from \$18,000 to \$20,000 each.

The Westinghouse Air Brake Co. has declared a quarterly dividend of five per cent. This was an increase in dividend, as the previous one had been four per cent.

The Consolidated Car Heating Co. has established a new department in its business to be known as the equipping department, in charge of J. H. Sewall as Superintendent of Equipment, with headquarters at Chicago.

##### Iron and Steel.

Col. J. A. Montgomery, President of the Mary Lee Coal Co., Birmingham, Ala., has been appointed receiver of the Talladega Iron & Steel Co., Ltd., of Talladega.

David Evans, General Manager of Barrow Steel Co., has been appointed General Manager of Bolckow, Vaughan & Co., Middlesborough, England.

At the annual meeting of the stockholders of the Bethlehem Iron Co. the following Directors were elected: R. H. Sayre, Joseph Wharton, E. P. Wilbur, R. P. Linderman, G. H. Myers, John Fritz and Beauveau Borie. The officers elected are: President, Robert P. Linderman; Vice-President and General Manager, Robert H. Sayre; Treasurer, C. O. Brunner; Secretary, Abraham S. Schropp; Chief Engineer and General Superintendent, John Fritz; Assistant-Superintendent, Russel W. Davenport. The new 125-ton steam hammer, which has been erected to make ordnance supplies, was started up in the presence of the directors.

Wm. Tod & Co., of Youngstown, O., has an order from the Pennsylvania Steel Co. for some additional hydraulic machinery for the new steel plant at Sparrow's Point, Md. This firm is also constructing some special machinery for the Pittsburgh Malleable Iron Co., of Pittsburgh.

The buildings and furnaces of the Damascus Steel Works, to be erected at Denver, Colo., are to be commenced as soon as a site is decided upon.

Over \$100,000 has been subscribed to the stock of the newly organized Atlanta Iron & Steel Casting Co., and the erection of a foundry at Atlanta, Ga., will begin this summer. The company propose to manufacture malleable-iron castings of all kinds and convert them into steel by the Bates process. Edward Van Winkle is President; H. L. Atwater, Vice-President; A. R. Bryan, Secretary, and W. H. Trezevant, Treasurer.

F. A. Marriott, Richard Wooley, Jr., and E. J. Adams are the proprietors of the newly formed Ivanhoe Rolling Mill & Iron Co., whose works are to be located at Ivanhoe, Ind., on the Michigan Central road. The plant of the Western Iron Co., in Kansas, near Kansas City, is to be removed to Ivanhoe.

The Cumberland & Unaka Iron & Steel Co., recently incorporated at Knoxville, Tenn., has organized, with J. L. Murphy, President; David Getaz, Vice-President, and W. R. Murphy, Secretary. This company's purpose is to control the Conley process of making steel.

The details of the removal of the South Boston Iron Works from South Boston, Mass., to Middlesborough, Ky., have been completed, and work upon the buildings commenced. The company will have a paid-up capital of nearly \$600,000, and will employ about 500 men. The company owns 40 acres of land near the outskirts of the city. W. B. Hart is President; John B. Carey, Secretary and Treasurer, and T. C. Derry, Superintendent. It is stated that the plant will be in operation inside of 15 months.



It is proposed to erect at Newcastle, Pa., a plant to make 400 tons of steel per day. Operations will begin early in July on the erection of the plant. It is said that at first two five-ton converters will be erected.

The foundry department of the Pennsylvania Steel Co.'s works, at Steelton, Pa., last week cast a bed-plate for the universal mill which weighed over 25 tons. The merchant mill at Harrisburg, will be closed for an indefinite period. It is rumored that other departments will also be closed.

An order for 4,000 tons of rails for the Rio Grande Western was booked this week by the Colorado Coal & Iron Co. This makes a total of 10,000 tons of rails now ordered. It is thought that the works will be kept going constantly for a year yet.

The Maryland Steel Co. has been incorporated in Maryland by Luther S. Bent, Frederick W. Wood, Rufus K. Wood, Walter S. Franklin and Edgar C. Felton, with a capital of \$1,000,000. The corporation is formed for the manufacture of iron and steel, the building of ships, locomotives, railroad cars and machinery. The office of the company will be at Sparrow's Point. Some of the incorporators are officers of the Pennsylvania Steel Co.

Morgan's Iron Works, in New London, Conn., were burned this week, the loss being estimated at \$75,000.

The finishing department of the Alabama Rolling Mills, near Birmingham, has been burned; loss about \$20,000.

The Chicago, Rock Island & Pacific will, it is reported, build a large roundhouse on a tract of 25 acres, near Blue Island, Ill., recently purchased.

#### Electric Pile Drivers.

Electricity for working pile drivers is attracting some attention. *La Nature*, in a recent issue, states that electric power has been successfully used in one of these machines in putting down the foundations of an annex to a paper mill near Paris. As the old section of the mill was provided with an electric-light plant lying idle during the day it was concluded to use the power for operating the pile driver. An Edison motor was mounted in the lower part of the pile-driver frame and transmitted power to a chain drum, fitted with fast and loose pulleys. By means of a suitable cut-out the current could be diverted from the motor to a resistance box when power for hoisting the pile driver was not needed. The machinery weighed 1,100 lbs., and the height of fall ranged from about 16 to 20 ft. A current of 63 amperes and 100 volts was employed, and the generator was about 330 ft. distant. The conductor was a copper wire, 0.2 in. in diameter.

#### Railroad Bridges in New York.

Since 1884 Charles F. Stowell, the bridge engineer of the State Board of Railroad Commissioners, has been engaged in an exhaustive investigation of the strains on railroad-bridge trusses throughout the state, and has received from every railroad in the state drawings of every truss bridge used for railroad purposes. As a result of Mr. Stowell's work the Board of Railroad Commissioners has completed and had printed in book form for distribution among the railroad companies an accurate record of the dimensions of every member of every railroad bridge in the state and of the strains thereon. The managers of the railroad companies have found weak places in many of their bridges of which they had no idea, and in nearly every case these bridges were strengthened before the drawings and strain sheets were sent to the board. As a result of this work 689 bridges have been criticised by the board, of which 535 have been repaired and 134 have been entirely rebuilt. Many bridges were repaired or rebuilt before the strain sheets were submitted. A further reason for this work has been the great increase of the weight of rolling stock within the last few years.

#### Cars for New South Wales.

The Railway Commissioners are calling for bids for 12 hozie refrigerator cars for the meat trade. A company is building a large establishment to prepare meat for export trade.

Ten platform cars have been built in Sydney for the New South Wales railroads on the designs known in England as the tubular frame car and here as the iron car. Sydney papers say that 120 of these have been ordered.

#### Light Passenger Cars for Suburban Trains.

The Wason Manufacturing Company is now building light passenger cars (similar to those which it makes for the Manhattan Elevated) for use on regular trains of several surface roads. Twenty have been built for the New York, New Haven & Hartford, to be used on the Harlem River branch, in trains which will run in connection with the Manhattan Elevated. President Fisk, of the Wason company, has been urging the use of these cars upon the managers of other roads, and he has now received an order for 10 of them for the Boston & Maine. They are also being tried on the Connecticut River. The cars for the Boston & Maine have Miller couplers and buffers, and are of the proper height to couple with ordinary cars, although the floor is a trifle lower. They are 40 ft. long, have seats for 48 persons and weigh only 15 tons. This makes a difference in dead weight of over 100 lbs. per passenger as compared with the ordinary 70-seat car, and the light cars have longitudinal seats, except for a short distance in the middle, so that there is more standing room available in case of a rush. These cars cost about \$1,000 less than a standard 70-seat passenger car of similar finish. The Boston & Maine cars have sliding doors and Wood's platform gate. These gates when shut hang so that their lower edges are close to the end of the platform, thus doing away with the large space, liable to bother careless passengers or children, which is found in some platform gates.

#### A "Multiple Speed" Railroad for the World's Fair.

The Chicago journals say that the Committee on Grounds and Buildings of the Columbian Exposition will authorize the Multiple Speed and Traction Company to construct an experimental line in Jackson Park with a view to showing the advantages of this system for transporting large crowds. Officers of the company say that this experimental line will surely be built and that the road will be immediately put under contract. This company controls the patents of Max E. Schmidt and J. L. Eilsbee, whose device we have already described. It consists first of a series of two-wheel trucks, or of pairs of car-wheels, each with its axle, running on ordinary rails. On the outer ends of the axles, on one side or both, is carried a continuous platform. Another platform is carried on movable rails, which run on the tops of the wheels which carry the first platform. This second platform has seats and a canopy. The first platform moves at the speed of the axles; the second one moves at twice that speed, as it is carried on the tops of the wheels. It is proposed that these plat-

forms shall be endless, and shall be kept in continual motion. The passengers can step on the first platform, which will run at a speed very little above an ordinary walking pace, and from that to the second platform, where they can sit and watch the novelties and glories of the "Columbian Exposition," or by which they can be carried from one part to the other of the grounds.

Mr. Schmidt is Secretary and General Manager of the company, and Mr. Octave Chanute, President of the American Society of Civil Engineers, is First Vice-President.

#### The Pacific Railroad of Costa Rica.

Mr. Walter Merivale, Resident Engineer and Agent of the Costa Rica Syndicate, Limited, contractors for the Pacific Railroad of Costa Rica, has presented a memorial to the President of Costa Rica to the effect that, in view of the great difficulties of constructing that road, the syndicate desires to be allowed to build part of it on the Abt system. It is proposed to use the rack road where the grades are above 3 per cent., and to use adhesion in other parts. The President has consented to this modification on the condition that the rack road shall not exceed one-fifth of the entire length of the line, the plans to be approved by the Ministry of Public Works.

The Costa Rican government guarantees 5 per cent. dividends on the cost of this road for 25 years. The cost is estimated at £800,000. The guarantee will begin from the date of the opening of the whole road for traffic. Each year the accounts of operation will be audited and the government will pay such a sum as is necessary to bring the net profits up to 5 per cent. on the cost.

#### The Eureka Cast Steel Company's New Plant.

Last Saturday occurred the opening for regular work of the new open-hearth plant of the Eureka Cast Steel Company, at Chester, Pa. Work on the new plant was begun last December, and the furnace, producers, stack, etc., were all finished on time, but the delay was caused by the late arrival of the 12-ton steam crane, built by the New Jersey Steel & Iron Co., of Trenton, N. J. The delay seemed unavoidable, as the crane was built for steel-casting work especially. It was designed by W. S. Halsey, civil engineer, of New York. It is operated by steam, and has all motions complete. The open-hearth furnace has a capacity of nearly 10 tons, and by widening the melting chamber at any time, for which provision has been made, the output can be increased to 12 tons. All valves, regenerators, ports, etc., are constructed of 12 tons capacity.

Some of the improvements in the construction of the furnace are believed to be novel, and were designed especially for the work. The regenerators are at the ends of the furnace proper and entirely independent. The furnace rests on heavy walls at the ends, and is carried bodily by large trusses lengthways of the bed. The ports at the ends are separate structures from the furnace proper, and are bound independently also. The furnace is also self-contained and alone, thus allowing any part to be repaired without cooling off any other part of the combined structure.

The space between the ports and main furnace is cooled by ventilation from the open space below. The ports are designed especially for making the hottest possible metal. They are protected from the direct cutting action of the flame, and combine the gas and air back of the melting chamber, thus insuring a perfectly even, solid flame all over the bed of the furnace. The ladles are heated in front of the furnace by a special gas flue carried through the open space below the bed, and the ladle-heating arrangements are compact and convenient.

The gas is furnished by two Herriek, round producers of latest form, very simple and effective, and there are certain novel features in the arrangement of steam, down comes, flues, etc., by which the large amount of soot usually deposited is largely avoided, and also any soot easily and conveniently removed.

The plant had a full and severe test last Saturday. One hundred Master Car Builders' knuckles in 50 flasks were prepared, and a regular soft heat was duly melted and poured. There was not the least friction anywhere—pouring of the heat occupying just 20 minutes, and the last metal flowed as well as the first tapped. The castings were apparently solid and perfect, and the plant was pronounced a success by all who saw the work.

The plant was designed and built by J. A. Herriek, of New York City. Mr. Herriek has also recently started a second large heating furnace by gas, for the Kimer Manufacturing Co., of Newburgh, N. Y., for their new wire mills. The first furnace is 20 ft. x 7 ft. on the bed, and was started some weeks ago, and the second one promptly ordered. This second furnace is 16 ft. x 7 ft. on the bed, contains all modern improvements, and is very simple in construction. Three round Herriek producers furnish the gas, and one stack does for the two furnaces.

#### Steel-Rail Mills for Australia.

Some weeks ago we published the fact that New South Wales has called for 175,000 tons of rails, manufactured in the colony "out of iron ore and other necessary minerals, the natural products of, and with coal, coke, or other fuel smelted, gotten and raised within the colony;" the deliveries to extend over a period of five years from Jan. 1, 1893, at a price equal to the ruling price for the time being for British-made rails landed at Sydney. The *Colliery Guardian* says that a syndicate of Scotch iron masters and a member of the New South Wales legislature are examining the probable profits of the operation, and have found that the iron ore analyses from 55.77 to 56.70 per cent. of iron; 0.044 to 0.045 per cent. of phosphorus, and 5.02 per cent. of silica; and hope for a profit of £2 per ton. Besides the contract for New South Wales they hope to supply the other Australian colonies and New Zealand.

#### New Stations and Shops.

It is reported that a roundhouse and machine shops for the Missouri, Kansas & Texas will be erected at Trinity, Tex.

The New York, Lake Erie & Western has completed plans for a handsome new station to be erected in Port Jervis, N. Y. The contract for erecting the building has been let to Gratton & Jennings, of Buffalo, and work has been commenced.

#### The Lake Shipbuilders.

Messrs. Wheeler & Co., of West Bay City, Mich., are the lowest bidders for the construction of four light-house tenders for the Atlantic coast. Four seaboard shipbuilders and five Lake yards completed. The successful bid is \$189,300 for the four vessels.

#### The Armor-Plate Mill at Homestead.

The old 32-in. mill at Homestead has been removed and a 4-high armor-plate mill put in its place within eight weeks. The rolling surface is 110 in. The top and bottom horizontal rolls are each 32 in., and the two middle rolls are 24 in. in diameter, while the four vertical rolls are of uniform size. Only the two middle rolls

are driven. The two engines, one for the horizontal and the other for the vertical rolls, are of the quick acting reversible type and aggregate 3,000 h. p. The rolls take a draft of 2 ins.

#### Julia Snow Plows.

The Rogers Locomotive Works are building six Julia snow plows, which will be ready for delivery Nov. 1.

#### THE SCRAP HEAP.

##### Notes.

Eight hundred longshoremen struck at Chicago last week for higher pay, and seriously impeded lake traffic.

An iron bridge which the Empire Portland Cement Co. was building over the Erie Canal at Warner's, N. Y., collapsed last Sunday and carried nine workmen into the canal. One man was killed and another seriously injured.

The Pullman Palace Car Co. has brought action in trover in the U. S. Circuit Court at Chicago for \$700,000 damages against the Chicago, Milwaukee & St. Paul for holding 45 hotel and dining cars in alleged disregard of contract with the former.

We are advised that in the United States Circuit Court, district of Massachusetts, in the case of the Dunham Mfg. Co., now the Q. & C. Co., against the Coburn Trolley Track Mfg. Co., a final decree and permanent injunction has been given against the Coburn Co. for infringement.

The State Board of Equalization of Montana has made an order requiring county assessors to return for assessment all railroad mortgages filed in their respective counties given to trust companies doing business outside the state. This will increase the taxable property of the state \$20,000,000.

The engineers of the New York Central train No. 1, which made the fast run on June 22, referred to in our last issue, were Messrs. Buchanan, Veeder and Hogan, running engines 870, 864 and 861, respectively. On June 20 Engineer Hogan made the eastbound trip from Buffalo to Syracuse, 151 miles, in 165 minutes. A distance of 69 miles was covered in 69 minutes.

The Railroad Commissioners of New Hampshire have had to postpone hearings on applications for decisions in land-damage cases on account of the vacancy in the Board caused by the resignation of Mr. Mitchell. The two remaining members hold that only a full board can exercise the powers conferred by the law in the case of questions of eminent domain.

The officers of the New York Central, after a conference with business men at Syracuse, have agreed to draw up complete plans looking to the rebuilding the line of that road through the city of Syracuse, so as to avoid grade crossings and the use of several streets now occupied by the railroad. The plans which the citizens desire carried out would involve an expenditure of over \$3,000,000.

##### Foreign Notes.

The Turkish Government is about to make an experiment with wood pavements in several of the streets of Constantinople. The pavement is to be put down by a French contractor.

German railroad statistics show that during the year 1890-91 the total number of passengers carried amounted to 376,825,000. There were 3,088 accidents, in which 602 people were killed and 2,112 were wounded.

The German engineer Poetsch, of Magdeburg, the inventor of the now widely known freezing process for excavation in soft ground, has applied to the City Council of Berlin for a franchise for an underground railroad. The motive power is to be electricity, compressed air or water under pressure.

The Prussian Minister of Railroads has recommended for adoption by the Government an innovation in the railroad service which, it is thought, will give widespread satisfaction. He proposes that every train official shall have fixed in his cap a number corresponding to that of the train to which he belongs and that stamped on the passenger tickets issued for that train. Passengers will have to simply compare their ticket number with that of the conductor or other train hand to ascertain whether or not they are on the right train. The scheme is meeting with favorable comment.

A German engineer discusses the subject of collisions on railroads, with special reference to the function of buffers as a means of taking up shock and reducing the chances of serious accidents. The buffers as ordinarily constructed and in use he considers entirely useless as safeguards, and, in fact, believes that they really help to make collisions more destructive in their results, owing principally to the large vertical and lateral displacement possible. One of the remedies which he suggests is to make the buffer plates alternately with convex and concave surfaces, so that one will fit into the other and the danger of one slipping past the other will be reduced. Such buffer plates, he claims, would practically constitute a series of ball-and-socket joints, and, besides acting as safety appliances simply, would add to the smoothness of running of the trains.

#### The Inter-Continental Railroad Survey.

Advices received by the Inter-Continental Railroad Commission from Chief Engineer Shunk show that the two civilian surveying parties are now well advanced on the work of surveying the country in the vicinity of Quito, Ecuador, for the proposed railroad between North and South America. The two parties left Quito, May 25, one working south and the other going north.

##### Iron.

Dr. Herman Wedding estimates the total production of finished iron in 1888 at 18,652,000 tons, which requires a production of 23,550,000 tons of pig iron. On this basis every inhabitant of the globe might have had 35 lbs. if it had been evenly distributed. In this country, however, we consumed nearly 300 lbs. per capita that year. If the consumption of the world had been at that rate it would have called for the production of 202,000,000 tons.

#### Land Grants in Texas.

The Supreme Court has rendered a decision in the land grant case brought by Attorney-General (now Governor Hogg), and involving the question whether the railroads are entitled, under the Texas Constitution of 1876, to land grants on account of siding and switches. The lower court gave judgment for the state. The Supreme Court reversed this on account of informalities, but holds with Gov. Hogg that the grants should not have been made on account of sidings and switches. Through this decision the state will recover over 6,000,000 acres to which patents have been improperly issued.



## LOCOMOTIVE BUILDING

Five locomotives have been put in service by the Delaware, Lackawanna & Western, and two on the New York, Providence & Boston with the Dean cross guide.

The Savannah, Americus & Montgomery has received two heavy locomotives from the Baldwin Locomotive Works, of Philadelphia. They have 54-in. driving wheels, 19 x 24-in. cylinders and extension fronts.

## CAR BUILDING.

The Wason Manufacturing Co., of Brightwood, Mass., is building eight passenger cars for the Central Vermont.

The Wisconsin Central has, it is reported, asked for bids for building 500 freight cars.

The Concord & Montreal has just added five new parlor cars for its White Mountain service. They were built by the Jackson & Sharp Co., of Wilmington, Del.

The New York & Sea Beach road has received eight open seashore cars from the Jackson & Sharp company.

## BRIDGE BUILDING.

**Albany, N. Y.**—The following bids for the superstructure of an iron bridge over the Erie Canal at Tonawanda were received by the Superintendent of Public Works, June 23: Rochester Bridge & Iron Works, \$14,396; Gorton Bridge & Mfg. Co., \$16,900; Hilton Bridge Construction Co., Albany, \$14,000; W. H. Shepard & Sons, Havana, N. Y., \$14,550; King Iron Bridge & Mfg. Co., Cleveland, O., \$15,000; The Berlin Iron Bridge Co., Berlin, N. Y., \$16,160. The contract was awarded to the Hilton Bridge Co.

**Allegheny, Pa.**—The Committee on Public Works of Allegheny is endeavoring to arrange for the rebuilding of the Herr's Island Bridge, washed away by the floods in the spring. The Pittsburgh & Western and the Western Pennsylvania will bear part of the expense.

**Arnprior, Ont.**—The contract was let last week for the erection of the new stone and iron railroad bridge about to be erected over the Madawaska River at Arnprior. It will cost about \$100,000. Besides the abutments this bridge will be supported upon two centre piers of stone and concrete, the work of building which will be considerable, the water in the river at the point being from 16 to 20 ft. in depth.

**Atlanta, Ga.**—The Bridge Committee of the City Council is again considering the Alabama-street extension matter. This will include the erection of a long bridge over the railroad tracks. The improvement will probably cost \$250,000.

**Belmont County, Ohio.**—The County Commissioners of Belmont County, Ohio, have let the contracts for the masonry on 11 new highway bridges to be built on the new highways that county is building in Pultney Township. McMillan Bros. took one bridge at \$4.72 per yard, two other bridges at \$4.97 per yard; Day & Gallagher the other eight at \$5.17 per perch. There were a number of other bids much above the prices at which the contracts were let. The contracts for the superstructure has not yet been let.

**Buffalo Mills, Va.**—Proposals for the building of an iron bridge over Buffalo Creek, near Buffalo Mills, will be received by D. A. Humphreys, of Lexington, Va.

**Castle Rock, Col.**—It is proposed to erect a bridge over the Osage River between Osage and Cole counties, near Castle Rock.

**Decatur, Ala.**—It is reported that an iron bridge 60 ft. wide will be built over the railroad tracks of the Louisville & Nashville Railroad at Decatur.

**Duxbury, Mass.**—The Plymouth County Commissioners have decided that a bridge should be constructed between Duxbury Beach and Powder Point. The bridge is to be of piling, with a draw.

**Fort Worth, Tex.**—Another bridge will be built over Trinity River, at Fort Worth, Tex. The City Council has adopted a resolution providing for its construction.

**Glasgow, Va.**—The Wrought Iron Bridge Co., which has the contract for the bridge to connect East Glasgow, expects that the work will be completed by Aug. 1. It will be 272 ft. long, with three spans 88 ft. each, with two iron piers and two stone abutments, and connect with Anderson street.

**Minneapolis, Minn.**—The City Engineer has prepared estimates of the cost of lowering and raising the tracks of the Hastings & Dakota in Minneapolis. The total cost of lowering will be about \$431,000, \$217,000 of which will be borne by the city. The total cost of raising the tracks was given at \$310,000, \$150,000 of which is to be paid by the city. The work includes the construction of 53 bridges, the cost of which is included in the estimates. Final action will probably be taken this month.

**New Decatur, Ala.**—It is reported that Frank Congra, of Gorton, N. Y., will purchase the bridge works of the Decatur Bridge Co., of New Decatur.

**Niagara, Ont.**—The Dominion Parliamentary Committee has passed the bill to incorporate the Ontario & New York Bridge Co., of which Sir Donald A. Smith, W. C. Van Horne, R. B. Angus, T. G. Shaughnessy, G. R. Harris, E. B. Osler, R. M. Wells, Thomas Tait, and Senator McInnes are directors.

**Ottawa, Ont.**—The long wooden bridge of the Ottawa & Gatineau Valley road which spans the Gatineau River, near Ottawa, Ont., has been partially destroyed by fire, and tenders will shortly be asked for its reconstruction.

**Prairie Lea, Tex.**—It is reported that a bridge will be built over the San Marcos River at Prairie Lea. The construction of the bridge is being agitated.

**Rock Island, Ill.**—Sealed proposals will be received until July 25 for constructing and erecting the iron work for a viaduct between Rock Island and the city of Rock Island, over the railroad tracks. Plans and specifications can be had on application to Captain M. W. Lyon, Ord. Dept., U. S. Army, Commanding.

**St. Cloud, Minn.**—Sealed proposals will be received by the County Commissioners of Stearns County, Minn., at St. Cloud, up to July 13, for building an iron highway bridge, of 160 ft. span, across Sauk River, in the town of St. Martin. Plans can be seen and specifications obtained from the County Auditor or Engineer.

**St. Louis.**—The cornerstone of the Duncan Avenue Bridge, on King's highway, which is about to be constructed to replace the viaduct now spanning that street, will soon be laid. The new structure is to be located at the corner of King's highway and Duncan avenue, Forest Park. The cost will be \$17,500, a portion of which was contributed by the Wabash Railroad.

**Sherman, Tex.**—A new wooden bridge will be built across North Travis street in Sherman.

**Sydney, N. S.**—Proposals have been invited for the iron work of Albert Bridge, Mira Ferry, Cape Breton County, by M. Murphy, Provincial Engineer, Halifax.

**Topeka, Kan.**—The Board of County Commissioners has decided to advertise for new bids for building the Quincy Street Suspension Bridge. Several amendments to the specifications, suggested by Mr. W. Hildebrand, of Roebing & Sons, to whom they were submitted, have been adopted.

**Weatherford, Tex.**—The stock company organized to build the bridge over the Brazos River is understood to have arranged to let the contract for the work.

**Wheeling, W. Va.**—The Edgemoor Bridge Works are building a plate girder bridge for double track across Wheeling Creek, at Wheeling, for the Wheeling Bridge & Terminal Railway Co. The bridge crosses the creek at an angle of 45 degrees and is supported by two piers and two abutments. The length is about 200 ft. The bridge is one of the heaviest of its kind, the plates of the girders being about 9 ft. wide.

**Wilkesborough, N. C.**—The County Commissioners are endeavoring to raise funds for a bridge across the Yadkin River west of Wilkesborough, and one across Roaring River east of Wilkesborough.

**Williamansett, Mass.**—The superstructure of the Williamansett Bridge over the Connecticut River at Williamansett between Holyoke and Chicopee is now ready for bids. It consists of four river spans, each 170 ft. centre to centre of end bearings. These are through trusses. Also two land deck spans each 51 ft. Bids may be sent to Mr. Edward S. Shaw, Consulting Engineer, 146 Franklin street, Boston, Mass.

**Winona, Minn.**—The Winona Railroad bridge, connecting the Green Bay, Winona & St. Paul road with the Winona & Southwestern, at Winona, is about completed, the draw having been successfully swung last week. The bridge is to be used by the Green Bay, Winona & St. Paul, the Winona & Southwestern and the Chicago, Burlington & Quincy.

## MEETINGS AND ANNOUNCEMENTS.

## Dividends.

Dividends on the capital stocks of railroad companies have been declared as follows:

*Canada Southern*, semi-annual, 1½ per cent., payable Aug. 1.

*Concord & Portsmouth*, semi-annual, 3½ per cent., payable July 1.

*Delaware, Lackawanna & Western*, quarterly, 1½ per cent., payable July 20.

*Detroit, Hillsdale & Southwestern*, semi-annual, 2 per cent., payable July 5.

*Dubuque & Sioux City*, \$1. per share, payable June 30.

*Granite*, \$2. per share, payable July 1.

*Iron*, semi-annual, 1½ per cent., payable July 10.

*Lake Shore & Michigan Southern*, semi-annual, 2½ per cent., payable Aug. 1.

*Little Schuylkill Navigation, Railroad & Coal Co.*, semi-annual, 3½ per cent., payable July 6.

*Michigan Central*, semi-annual, 2 per cent., payable Aug. 1.

*Nashville, Chattanooga & St. Louis*, quarterly, 1½ per cent., payable Aug. 1.

*Pittsburgh, Fort Wayne & Chicago*, quarterly, 1½ per cent., payable July 7; and special, quarterly, 1½ per cent., payable July 1.

*Portsmouth & Dover*, semi-annual, 3 per cent., payable July 1.

*Richmond & Petersburg*, semi-annual, 3½ per cent., payable July 1.

*Rock Island & Peoria*, semi-annual, 2½ per cent., payable July 1.

*Rutland*, 2 per cent., payable July 1.

*Southwestern (Georgia)*, annual, \$3.50 per share, payable June 30.

*Vermont Valley*, semi-annual, 3 per cent., payable July 1.

## Stockholders' Meetings.

Meetings of the stockholders of railroad companies will be held as follows:

*Alabama Midland*, annual, Montgomery, Ala., July 15.

*Columbus Southern*, annual, Third National Bank Building, Columbus, Ga., July 8.

*Dubuque, South Shore & Atlantic*, annual, Marquette, Mich., July 16.

*Marquette, Houghton & Ontonagon*, annual, Marquette, Mich., July 16.

*Mineral Range*, annual, Hancock, Mich., July 14.

*New York & Massachusetts*, annual, Poughkeepsie, N. Y., July 14.

*Savannah, Americus & Montgomery*, annual, Americus, Ga., July 9.

*Suffolk & Carolina*, special, Suffolk, Va., July 9.

## Technical Meetings.

Meetings and conventions of railroad associations and technical societies will be held as follows:

The *New England Railroad Club* meets at its rooms in the United States Hotel, Beach street, Boston, on the second Wednesday of each month, except June, July and August.

The *Western Railway Club* holds regular meetings on the third Tuesday in each month, except June, July and August, at the rooms of the Central Traffic Association in the Rookery Building, Chicago, at 2 p. m.

The *New York Railroad Club* meets at its rooms in the Gilsey House, New York City, at 2 p. m., on the third Thursday in each month.

The *Southern Railway Club* holds regular meetings on the third Thursday of the months of January, February, March, May, September and November at such points as are selected at each meeting.

The *Central Railway Club* meets at the Hotel Iroquois, Buffalo, the fourth Wednesday of January, March, May, September and November.

The *Northwest Railroad Club* meets on the first Saturday of each month, except June, July and August, in the St. Paul Union Station, at 7:30 p. m.

The *Northwestern Track and Bridge Association* meets on the Friday following the second Wednesday of each month at 7:30 p. m. in the directors' room of the

St. Paul Union Station, except in the months of July and August.

The *American Society of Civil Engineers* holds its regular meetings on the first and third Wednesday in each month, at the House of the Society, 127 East Twenty-third street, New York.

The *Boston Society of Civil Engineers* holds its regular meetings at the American House, Boston, at 7:30 p. m. on the third Wednesday in each month.

The *Western Society of Engineers* holds its regular meetings at 78 La Salle street, Chicago, at 8 p. m., on the first Wednesday in each month.

The *Engineers' Club of St. Louis* holds regular meetings in the club's room, Laclede Building, corner Fourth and Olive streets, St. Louis, on the first and third Wednesdays in each month.

The *Engineers' Club of Philadelphia* holds regular meetings at the House of the Club, 1122 Girard street, Philadelphia, on the first and third Saturday of each month, excepting in January, when the annual meeting is held on the second Saturday of the month. The second January meeting is held on the third Saturday. The club stands adjourned during the months of July, August and September.

The *Engineers' Society of Western Pennsylvania* holds regular meetings on the third Tuesday in each month, at 7:30 p. m., at its rooms in the Thaw Mansion, Fifth street, Pittsburgh, Pa.

The *Engineers' Club of Cincinnati* holds its regular meetings at 8 p. m. on the third Thursday of each month in the rooms of the Literary Club, No. 24 West Fourth street, Cincinnati.

The *Civil Engineers' Club of Cleveland* holds regular meetings on the second Tuesday of each month, at 8 p. m., in the Case Library Building, Cleveland. Semi-monthly meetings are held on the fourth Tuesday of the month.

The *Engineers' Club of Kansas City* meets in Room 200, Baird Building, Kansas City, Mo., on the second Monday in each month.

The *Engineering Association of the South* holds its monthly meetings on the second Thursdays at 8 p. m. The Association headquarters are at Nos. 63 and 64 Baxter Court, Nashville, Tenn.

The *Denver Society of Civil Engineers and Architects* holds regular meetings at 36 Jacobson Block, Denver, on the second and fourth Tuesday of each month, at 8 o'clock p. m., except during June, July and August, when they are held on the second Tuesday only.

The *Civil Engineers' Society of St. Paul* meets at St. Paul, Minn., on the first Monday in each month.

The *Montana Society of Civil Engineers* meets at Helena, Mont., at 7:30 p. m., on the third Saturday in each month.

The *Civil Engineers' Association of Kansas* hold regular meetings at Wichita on the second Wednesday of each month at 7:30 p. m.

The *American Society of Swedish Engineers* holds meetings at the club house, 250 Union street, Brooklyn, N. Y., and at 347 North Ninth street, Philadelphia, on the first Saturday of each month.

The *Engineers' Club of Minneapolis* meets the first Thursday of each month in the Public Library Building, Minneapolis, Minn.

The *Canadian Society of Civil Engineers* holds regular meetings at its rooms, 112 Mansfield street, Montreal, P. Que., every alternate Thursday except during the months of June, July, August and September.

The *Technical Society of the Pacific Coast* holds regular meetings at its rooms in the Academy of Science Building, 819 Market street, San Francisco, Cal., at p. m. on the first Friday of each month.

The *Association of Civil Engineers of Dallas* meets at 803 Commerce street, Dallas, Tex., on the first Friday of each month at 4 o'clock p. m.

The *Montana Society of Civil Engineers* meets at Helena, Mont., at 7:30 p. m., on the third Saturday in each month.

The *Civil Engineers' Association of Kansas* holds regular meetings at Wichita on the second Wednesday of each month, at 7:30 p. m.

The *American Society of Swedish Engineers* holds meetings at the club house, 250 Union street, Brooklyn, N. Y., and at 347 North Ninth street, Philadelphia, on the first Saturday of each month.

The *Engineers' Club of Minneapolis* meets the first Thursday of each month in the Public Library Building, Minneapolis, Minn.

The *Canadian Society of Civil Engineers* holds regular meetings at its rooms, 112 Mansfield street, Montreal, P. Que., every alternate Thursday except during the months of June, July, August and September.

The *Technical Society of the Pacific Coast* holds regular meetings at its rooms in the Academy of Sciences Building, 819 Market street, San Francisco, Cal., at 8 p. m. on the first Friday of each month.

The *Roadmaster's Association of America*.

The next annual convention of the Roadmasters' Association of America will be held at Minneapolis, Sept. 8, 9 and 10.

## PERSONAL.

—The resignation of Mr. Thomas Moore, Manager of the Indianapolis Freight Bureau, is announced.

—General Manager George F. Evans, of the Louisville, Evansville & St. Louis, it is now understood did not resign his position, as was rumored.

—Mr. Edward W. Converse, of Boston, has been elected President of the National Tube Works Co., of McKeesport, Pa., to succeed the late Mr. James C. Converse.

—Mr. M. L. Hinman, Vice-President of the Brooks Locomotive Works, of Dunkirk, N. Y., has been elected President of the Lake Shore National Bank, of Dunkirk.

—Mr. W. R. Crumpton, General Manager of the Belaire, Zanesville & Cincinnati road, has tendered his resignation to accept a similar position on the Baltimore & Lehigh road.

—Mr. Edgar Hill, who has recently resigned his position as General Freight Agent of the Cleveland, Cincinnati, Chicago & St. Louis, has been elected President of the United States Barb Wire Co.

—Mr. George S. Rice, Mem. Am. Soc. C. E., at present Deputy Chief Engineer to the Aqueduct Commission of New York City, will go to Boston as Engineer of the Rapid Transit Commission of that city.

—Mr. T. S. Timpson, General Eastern Agent of the Cleveland, Cincinnati, Chicago & St. Louis, has resigned, and the office is abolished. The office was removed from New York to Buffalo about two months ago.

—Mr. Hamilton Spencer, of Bloomington, Ill., a well-known lawyer of that city, was fatally injured by a



cable car in Chicago, June 23. Mr. Spencer was 76 years of age. He was General Manager of the Chicago & Alton road about 1854.

—Mr. J. K. Waterman, General Freight Agent of the Colorado Midland, is understood to have received from the St. Louis Freight Bureau the proffer of the commissionership at a salary of \$10,000. Mr. Waterman says he will not accept the position at that salary.

—Mr. John Egan, General Ticket Agent of the Cleveland, Cincinnati, Chicago & St. Louis, has resigned, and the duties of the office have been assigned to Mr. D. B. Martin, with the title of General Passenger and Ticket Agent. Mr. Egan was formerly General Passenger and Ticket Agent of the Cincinnati, Indianapolis, St. Louis & Chicago.

—Mr. George H. Kimball, Chief Engineer of the Lake Shore & Michigan Southern for the last two years and a half, has resigned. Mr. Kimball was Division Superintendent of the New York, Chicago & St. Louis for about six years before he became connected with the Lake Shore & Michigan Southern. He was appointed Chief Engineer of that line in March, 1889. Mr. Kimball has been succeeded by Mr. E. A. Handy, Division Engineer of the Lake Shore.

—Mr. Rollin Manville, Superintendent of the Pennsylvania Division of the Delaware & Hudson Canal Co., died at his summer cottage at Fairview, Pa., June 23, aged 67 years. His connection with the Delaware & Hudson Canal Co. dated from January, 1856. Between 1849 and 1856 he served in the engineer corps of a number of Eastern companies. Mr. Manville was Assistant Superintendent of the Delaware & Hudson Canal Co. for eight years after 1856, but since 1864 he has been Superintendent of the Pennsylvania Division.

—Mr. Benjamin F. Jervis, Secretary of the Toledo, Ann Arbor & North Michigan, will soon resign that position, and will be succeeded by Mr. F. S. Chandler, at present Assistant Secretary and Purchasing Agent. Mr. Jervis has been connected with the Toledo, Ann Arbor & North Michigan since 1878. Until 1884, when he was appointed Treasurer and Paymaster, Mr. Jervis had been Auditor and Paymaster. For the last few years he has been Secretary, residing in New York. Mr. Jervis is well advanced in years and purposes to retire from business.

—Mr. H. Walters, for many years Vice-President and General Manager of the roads forming the Atlantic Coast Line system, resigned this week. He has been succeeded as General Manager by Mr. John R. Kenly, formerly Superintendent of Transportation, but since January, 1889, Assistant General Manager. The office of Traffic Manager has been created and Mr. Thomas M. Emerson has been appointed to that position. He has been General Freight and Passenger Agent since 1882. He was previously Assistant General Freight Agent of the Chesapeake & Ohio for about a year. Before assuming that position he had been Chief Clerk in the general freight and passenger department of the Atlantic Coast Line, and was also for about a year Assistant General Freight Agent of the same system.

#### ELECTIONS AND APPOINTMENTS.

**Atlantic Coast Line.**—J. R. Kenly has been appointed General Manager, and T. M. Emerson, Traffic Manager, both with office at Wilmington, N. C.

**Baltimore & Lehigh.**—The following officers were elected at Baltimore last week: President, William Gilmore; Vice-President, George M. Jewett; Directors, Hugh B. Jones, Charles R. McConkey, George M. Jewett, James Lee, George E. Silver, Winfield J. Taylor, Samuel H. Crawford and Warren F. Walworth; Secretary, John K. Shinn; Treasurer, Fridge Murdock.

W. R. Crumpton has been appointed General Manager, with office in Baltimore.

**Bellair, Zanesville & Cincinnati.**—J. K. Geddes, Chief Engineer, has been appointed General Manager, with office at Zanesville, O., to succeed W. R. Crumpton, resigned.

**Chesterfield & Kershaw.**—A meeting of the incorporators was held at Chesterfield C. H., S. C., June 23, for organization, and the following Directors were elected: Dr. J. W. McCay, President, and H. W. Finlayson, R. T. Caston, J. H. Hardin, Alexander Bolin, Duncan Wilkes, J. C. Winburn, C. W. Ingram, Neill Bethune and H. G. Garrison.

**Chesterfield & Lancaster.**—The following Directors were elected at a meeting of the incorporators at Chesterfield, S. C., June 23: W. A. Evans, President; C. L. Evans, Edward McIver, W. F. Stevenson, D. M. Barrentine, John F. Miller, J. T. Funderburk, J. M. Hough, J. A. Sellers and John B. Irvin.

**Chicago, Burlington & Kansas City.**—The following appointments are announced: H. W. Taylor, Assistant Auditor; C. W. A. Cartledge, Auditor of Expenditures; G. W. Miller, Freight Auditor; T. D. Hermance, Ticket Auditor. All with office at St. Joseph, Mo.

**Chicago & Eastern Illinois.**—W. M. Apps, recently Master Car Builder of the Western of Alabama, has been appointed Master Car Builder of this road.

**Chicago, Iowa & Dakota.**—At the annual meeting at Eldora, Ia., June 10, the following directors were elected: John Porter, W. S. Porter, George H. Wisner, J. H. Smith, Eldora; David Secor, Winnebago City, Minn.; Martin Pritchard, Alden; H. N. Brockaway, Garner, Ia. The directors elected the following officers: John Porter, President and General Manager; David Secor, Vice-President; J. D. Newcomer, Secretary; H. N. Brockaway, Treasurer.

**Cincinnati, Portsmouth & Virginia.**—The following directors have been elected by this company, which succeeds the Ohio & Northwestern: Henry M. Hoyt and Crawford Arnold, Philadelphia; Thomas R. White, Jr., New York; George West, Ballston, N. Y.; Henry Lewis, Samuel Hunt, Thomas D. Rhodes, John B. Keys and H. C. Hollister, Cincinnati. The Board elected the following officers at a meeting at Cincinnati, June 25: Samuel Hunt, President; Thomas D. Rhodes, Secretary; Thomas Hunt, Treasurer; H. C. Hollister, General Counsel.

**Cleveland, Cincinnati, Chicago & St. Louis.**—The General Manager has issued a circular announcing the appointment of G. W. Kittridge as Chief Engineer of the entire system, with the following as engineers of maintenance of way on the respective divisions: S. H. Hazard, Cleveland Division, from Delaware to Cleveland; W. M. Duane, Indianapolis Division, from Galion to Indianapolis; F. Woodbridge, Sandusky Division; A.

Sherwin, St. Louis Division; F. S. Balcon, Cairo Division; and Thomas Morris, Chicago Division. E. T. McConnell, of Indianapolis, has been appointed Engineer of Maintenance of Way of the Peoria & Eastern.

C. F. Rhodes, of the Cincinnati and Columbus Division, having declined the superintendency of the Peoria and Eastern division, the position has been accepted by A. H. Palmerton, Trainmaster of the division.

John Egan, General Ticket Agent, has resigned that office to accept the office of Superintendent of Dining-Car Service of the same system, with headquarters at Cincinnati. D. B. Martin, the General Passenger Agent, has been appointed General Manager and Ticket Agent, and will have control of the passenger and ticket departments, which have been consolidated.

J. Q. Van Winkle, in addition to his duties as Superintendent of the St. Louis Division, has been appointed Superintendent of Indianapolis Terminals. A. G. Wells has been appointed Superintendent of the Indianapolis Division, vice Mr. Van Winkle, transferred.

**Columbus, Hocking Valley & Toledo.**—L. P. Ramsey Roadmaster of the Ft. Wayne Division of the Lake Erie & Western, has been appointed Engineer of Maintenance of this road. Mr. Ramsey was formerly Division Roadmaster of the Cincinnati, Hamilton & Dayton.

**Denver, Apex & Western.**—H. A. Sumner has been appointed Chief Engineer of this road, with office in the Taber Building, Denver, Col.

**Evansville & Terre Haute.**—Robert A. Campbell, who for eight years has been the General Agent of the Chicago & Eastern Illinois and the Mackey lines at Terre Haute, Ind., has been appointed General Passenger Agent of all the Mackey lines, with headquarters at Evansville.

**Lake Shore & Michigan Southern.**—E. A. Handy has been appointed Chief Engineer, with office at Cleveland, O.

George N. Dow has been appointed Division Master Car Builder of this company, with headquarters at Cleveland, O., vice James Withycombe, transferred to other duties. His jurisdiction includes the Toledo and Eastern Division, from Berea, O., to Westfield, N. Y., and the Franklin Division. All employees of the car department on the Eastern Division, from, but not including Westfield, N. Y., to and including Buffalo, report directly to A. C. Robson, Division Master Car Builder at Buffalo.

**Lewiston, Augusta & Camden.**—The company has organized at Augusta, Me., with the following directors: President, Elias Milliken; John W. Chase, George E. Macomber, John F. Hill, Augusta; James W. North, P. O. Vickery, W. H. Williams; Treasurer, M. V. E. Chase, Augusta; Clerk, F. E. Southard.

**London Southeastern.**—At the annual meeting of the shareholders of this Canadian company the following officers and directors were re-elected: W. J. Reid, President; John Campbell, Vice-President; Secretary and Treasurer, J. W. Little. Directors, John Marshall, W. J. Reid, John Campbell, John Bland, J. W. Little and T. H. Smallman.

**Long Beach & Alamitos Bay.**—The following are the Directors of this California road: E. Bouton, T. B. Burnett, James Campbell, A. W. Barrett, S. O. Houghton, E. P. Johnson and H. L. Bissell, all of Los Angeles, Cal.

**Lynchburg & Durham.**—The following appointments have been announced: R. C. Standard, Acting Superintendent, in charge of transportation and traffic, vice W. N. Mitchell, General Superintendent, resigned. J. W. Goodwin, Chief Engineer and Superintendent of Motive Power; F. H. Williams, Secretary and Treasurer; C. C. Dunn, Jr., Auditor and Purchasing Agent.

**Macon & Savannah Construction Co.**—The stockholders of the company have elected the following officers and directors: President, H. J. Lamar, Sr.; Vice-President, W. B. Sparks. Directors: I. R. Saques, Macon, Ga.; A. Bacher, W. L. Strong, S. Stein, New York; J. R. Young, Savannah.

**Missouri Pacific.**—Harry Flanders, who has been Assistant Superintendent of the Arkansas Division of the St. Louis, Iron Mountain & Southern at Little Rock, Ark., has been promoted to the superintendency of the Central Division of the same system, with headquarters at Fort Smith, Ark., vice E. T. Horn, resigned.

Warren Baldwin, Passenger Conductor, has been appointed Division Superintendent of the Little Rock, Mississippi & Texas, the Warren branch of the St. Louis, Iron Mountain & Southern, and Houston, Central Arkansas & Northern Roads.

**Monterey & Mexican Gulf.**—J. C. Ray, who has been connected with the Mexican National road for nearly 10 years, has been appointed General Agent at Tampico, Mex.; S. B. Burton, formerly Superintendent of the Mexican Central, has been appointed Superintendent of the Tampico Division, with headquarters at Victoria, Mex.

**New York, Lake Erie & Western.**—W. D. Scott, heretofore Manager of the Southern Dispatch of the Chicago & Eastern Illinois, has been appointed Southern Freight Agent of this road, with headquarters in Chicago.

**New York & Pennsylvania.**—The resignation of W. L. Doyle having been withdrawn, he has resumed the duties of that office.

**Pamlico, Oriental & Western.**—The following have been elected directors of this company, recently chartered by the South Carolina Legislature: Charles H. Fowler, Dr. F. P. Gates, W. H. Sawyer, D. B. Hooker, John F. Crowell, Jas. O. Baxter, Thomas Campen and Charles M. Babbitt. The directors elected Hon. W. T. Cabo President and George T. Farnell Secretary and Treasurer. The headquarters of the company are at Bayboro, S. C.

**Peoria & Eastern.**—A. H. Palmerton, Trainmaster, has accepted the position of Superintendent of the Peoria & Eastern, in place of C. F. Rhodes, declined.

**San Pete Valley.**—At the annual meeting of the stockholders of the company held at Nephi, June 22, the following Directors were elected: Hon. A. G. J. Ponsby, Theodore Bruback, J. D. Clinton, George Cudens, H. S. Kerr, C. F. Annett, R. L. Scannell. The directors elected Theodore Bruback President, J. D. Clinton Vice-President and H. S. Kerr Secretary and Treasurer.

**South Bound.**—The annual meeting was held at Savannah, Ga., June 23. The stockholders elected the following Board of Directors for the year: A. C. Haskell, Columbia, S. C.; John Gill, Baltimore; H. M. Comer, John Flannery, Hermann Myers, B. A. Denmark and S. Guckenheimer, Savannah. The directors elected the

following officers: President, H. M. Comer; Vice-President, B. A. Denmark; Treasurer, Hermann Myers; Secretary, M. Hamilton; Chief Engineer and Superintendent, G. Dole Wadley.

**South Brunswick, Atlanta & Northwestern.**—William D. Wheelwright, 82 Wall street, New York City, James O. Bloss, George T. Dixon, Herbert Richmond and William M. Walton, of New York City, have given notice of their intention to apply for a charter for this company in Georgia.

**South Chester.**—The following are the directors of this company chartered in Pennsylvania last week: John P. Green, President; R. D. Barclay, Lewis Neilson, John C. Simms and Stephen W. White, all of Philadelphia; William A. Patton, Radnor, Pa., and N. P. Shortridge, Wynnewood, Pa.

**South Dakota Railroad Commission.**—F. P. Phillips, of Watertown, S. D., has been appointed a member of the Commission, in place of A. D. Chace, resigned.

**Union Pacific.**—W. S. Hughlett, Chief Dispatcher of the Spokane Falls branch, has been appointed Acting Superintendent, vice W. H. Holcomb, Jr., resigned. J. H. Young has been appointed Superintendent of the Utah Division, with headquarters at Salt Lake City.

**Weatherford, Mineral Wells & Northwestern.**—At the annual meeting of the directors of the road at Weatherford, Tex., June 27, T. R. Stone was elected President and W. S. Stone Vice-President.

#### RAILROAD CONSTRUCTION, Incorporations, Surveys, Etc.

**Arcadia, Lakeland & Gulf.**—Three surveying parties are said to be working on this line, from Lakeland, from Boca Grande and from the Manatee River. The road is to extend from Lakeland through Arcadia to Boca Grande Pass, with a branch from Arcadia to the Manatee River. Anthony Peters, of Boston, is President, and K. B. Harvey, of Punta Gorda, Fla., Chief Engineer.

**Atlantic Coast Line.**—The right of way has been secured and grading begun at Latta, S. C., for the branch which it is supposed to build from Latta on the Florence branch to a point in Marlboro County, near Dunbar's, in the direction of McColl's, on the Cape Fear & Yaddin Valley road.

**Baltimore & Delaware Bay.**—The company is extending its line to Nicholson's and will probably continue it to Tolchester Reach, Md.

**Baltimore & Ohio.**—The City Council of Wheeling has granted the company the privilege of crossing two streets and an alley in that city so as to make it possible for the company to build a yard on the bank of Wheeling Creek for the discharge of freight to those jobbing-houses and small manufacturers who have no direct sidings to their places of business. The yard will be about 360 ft. in length and will have seven tracks. The company has also presented to the City Council a plan for the removal of its tracks from Sixteenth street and placing them along the creek bank on the opposite side of the creek. The presence of the tracks on Sixteenth street has long been the cause of great annoyance to the city, and the grade is so heavy that freight trains have always been forced to have helpers. The present plan proposed by the company is very satisfactory to the city, except in a few minor details, and will probably be accepted.

**Bishopville.**—About four miles of the extension which is being built from Bishopville has been completed and it is expected that the next five miles will be in operation by Nov. 1. The extension upon which work is now in progress is being built through Sumter County, in a general northwesterly direction for about nine miles from Bishopville. This is as far as the line will be built at present, as it is still undecided what point will be the northern terminus. It is proposed to build to Kershaw or Lancaster, S. C., a distance of about 40 miles, or else in a more northerly direction to Charlotte or Monroe, N. C., about 55 miles.

**Boynton & National Park.**—A charter has been asked for this company by J. M. Sutton, C. Marshbank, H. Whiteside and H. Bond, of Chattanooga, Tenn., and Cutler Smith, of Boynton, Ga. The company was organized at Chattanooga this week. It intends to construct a belt road around the Chickamauga and Chattanooga national parks. It will extend to Harrison, on the Tennessee River, reaching at Tyner's Station, Tenn., Graysville, Boynton and Chickamauga, Ga., and re-enter Chattanooga by the Chattanooga Southern road.

**Bristol, Elizabethton & North Carolina.**—The contract for grading the road from Elizabethton, Tenn., to Mountain City, Tenn., a distance of 40 miles, has, it is reported, been let to Joseph Caldwell.

**Brockville, Westport & Saint Ste. Marie.**—It is announced that the control of this has passed into the hands of an investment company in Philadelphia, which has a heavy financial interest in it. Mr. S. Hunt, of Cincinnati, General Manager of the Ohio & Northwestern Ry., has been appointed General Manager. The other officers of the company will remain the same as before. Mr. R. G. Hervey still continues president of the company. The new management is said to be willing to proceed with the extension of the road to Palmer's Rapids, about 80 miles from Westport, Ont.

**Calgary & Edmonton.**—The grading has been completed to within 11 miles of Edmonton, Alberta, the northern terminus, and the track has now been laid north of the Battle River for a distance of about 15 miles. The contractors expect to have the line completed to Calgary about Aug. 1. The track was laid last year to the Red Deer River north of Calgary and about 60 miles has been laid this year further north. The total amount of track laid on the northern division up to July 1 is 150 miles. This leaves about 40 miles of rails to be laid to complete the work to the North Saskatchewan River at Edmonton. The contractors are reported to have nearly 5,000 men at work on the line at present. The maximum grade on the northern division is 52 ft. per mile and the maximum curves are four degrees. The grading is easy, but there is a large amount of bridging and trestling. The principal bridges are over the Bow River, Red Deer River, Sheep River and High River. The surveys have been completed for the southern division from Calgary south to Fort McLeod, a distance of 110 miles. It is expected that 50 miles of the grading will be completed before January. James Ross, of Montreal, has the contract for building the entire line. All the sub-contracts for the work proposed this year have been let.



**Charleston, Clendenin & Sutton.**—The County Court at Charleston, W. Va., has called a special election to be held in Charleston, Elk and Big Sandy districts Aug. 1 to vote on the proposed issue of bonds for subscriptions to the stock of the railroad. Charleston district will vote on the proposition to issue \$80,000, Elk \$15,000 and Big Sandy \$5,000. This \$100,000, with the \$75,000 promised by private subscriptions in Charleston, and the amount that may be subscribed by the county of Clay, will be sufficient, it is reported, to insure the immediate construction of the line.

**Charleston, Sumter & Northern.**—The extension from Darlington northeast to Bennettsville, S. C., will probably be opened for traffic July 5. The track was laid last week on the four miles between Pee Dee River and Robbin's neck, completing that work. The extension is 24 miles long.

**Chippewa Valley.**—President Monjo, who is in Europe, is reported to have written that he has arranged for funds to complete the road from Mount Pleasant northwest to Big Rapids, Mich., about 25 miles. The road is to be extended to near Manistee from the latter point. The surveys have been made as far as Big Rapids. Little has been done on the project since the fall of 1889.

**Danville & East Tennessee.**—C. R. Moorman and J. B. Sullivan, of Lynchburg, Va., have not accepted the contract to build the road from Bristol to Damascus, Va., as recently reported. It is not likely that any considerable amount of construction work will be undertaken this summer on any part of the line.

**East Louisiana.**—There is said to be some prospect of completing this year the long projected extension to Franklinton, in the northern part of Washington Parish, La. The extension is about 25 miles long, and will begin at Covington, near the present terminus, and extend north.

**Fort Worth & Rio Grande.**—The tracklayers on the Brownwood extension have reached Blanket, and are now working south of Blanket Creek. The rails will reach Brownwood July 18, but the steel bridges will not be erected for some time after that date. False work will be put in and the track laid across until the bridges are completed. The road will probably be ready for traffic to Blanket this week.

**Interstate Switch Co.**—This company has been incorporated with headquarters at Kansas City, Mo., to build a railroad 9½ miles long, 5½ miles to be in Jackson County, Mo., and four miles in Wyandotte County, Kan. The Directors are A. P. Fonda, N. McAlpine, R. D. Swain, R. M. Ray and I. H. Kinley.

**Kansas City, Nevada & Ft. Smith.**—The extension of this road, which is now being graded, is 10 miles long, extending from Amoret, the present terminus of the line, through Worland and Ward, to Hume, all in Bates County, Mo. Smith & Bradbury, of Kansas City, Mo., are the contractors for grading, and they now have a large force on the work. The extension is free from heavy grades and curves, and there is but one bridge of any importance. It spans the Marais de Cygne three miles south of Amoret. A temporary structure will be placed there, to be supplanted by a steel and wooden bridge as soon as the material is received from the bridge builders.

**Kansas City, Watkins & Gulf.**—The Chief Engineer has just completed another preliminary survey from Alexandria, La., north to Marble City, in Winn Parish, a distance of 40 miles. The locating survey will be commenced in 60 days.

**Lake Jessup, Indian River & Atlantic.**—A locating survey is being made by J. O. Fries, from Lake Jessup south to the Indian River at Coquina, Fla. The right of way has been secured for the 45 miles between this point, and subsidies have been granted by some of the towns. J. B. Bower, of Coquina, is a director.

**Lindsay, Bobcaygeon & Plentypool.**—The board of trade, leading citizens, of Lindsay, Ont., and members of the county council have asked the Dominion government to grant a bonus of about \$64,000 for 20 miles of this road beginning at Lindsay and extending north-east to Bobcaygeon.

**Long Beach & Alamitos Bay.**—This company was incorporated in California last week to build a branch of the Los Angeles Terminal road from Long Beach, Cal., to Alamitos Bay, a distance of about three miles. The capital stock is \$100,000. T. B. Burnett, of Los Angeles, is General Manager.

**Lynchburg & Durham.**—The directors of the company are again considering the construction of an extension south from Durham, N. C., to a connection with the Raleigh & Gaston. At a recent meeting of the stockholders the directors were empowered to issue bonds for the purpose.

**Manitoba & Assiniboia.**—This company is seeking incorporation of the Dominion parliament to build a line from Regina, or some point on the Qu'Appelle, Long Lake & Saskatchewan road, crossing the Winnipeg & Hudson Bay route, to Lorne Point, on Lake Winnipeg. The capital stock of the company is \$500,000.

**Martinsburg Belt.**—Surveys are being made at Martinsburg, W. Va., for a belt line to be built around the town, and connect with the Baltimore & Ohio and other roads and the manufacturing establishments. The Martinsburg Mining & Manufacturing Co. is largely interested in the enterprise.

**Mexican Central.**—The Tampico division will be operated for regular income account, beginning July 1. Hitherto the road has been used mainly for transporting material to Tampico Harbor.

**Mexican Roads.**—A concession has been granted to José Valenzuela for building a standard-gauge road to begin at Ciudad Porfirio Díaz (formerly Piedras Negras), crossing the Mexican National between the stations of Lampazos and Bustamante, and passing through Cerralvo, terminating at Monterey. Construction is to commence within two years. A subvention of \$8,000 per kilometre is granted, payable to the company in six per cent. subsidy bonds. This road is projected mainly for the purpose of reaching the Valenzuela coal mines. The Government stipulates that the company shall sell coal in the City of Mexico at a price not to exceed \$12 per ton.

**Middle Georgia & Atlantic.**—About seven miles of track has been laid north of Machen toward Covington, Ga., and it is stated that the grading will be commenced

at the latter place about July 15. The road was graded between the two points last fall. The distance is about 25 miles.

**Mississippi & Little Rock.**—The track has been laid on about 13 miles of this road in eastern Arkansas near Duncan. The track is laid from the connection with the St. Louis Southwestern, about two miles being laid east toward White River and the balance west of the road to Fairmount, Ark. The road is being built by R. W. Worthen, of Little Rock, but only a small force is being employed at present and the tracklaying west of Fairmount toward Little Rock will progress very slowly.

**Missouri Pacific.**—The Plattsmouth cut off line between Union and Gilman, near Plattsmouth, Neb., on the main line between Omaha and Kansas City, was completed last week, and regular trains are now running over the new line. The new road is said to shorten the main line from Omaha to Kansas City about 20 miles, reducing the distance between the two joints to 198 miles.

**New Roads.**—About 350 men are working south of Archer, Fla., on what is called the Ambler road. It is projected to Dunnellon, about 30 miles south of Archer. The line has only been located as far as Townships 14 and 15, Range 19, and will probably not be built beyond that point for the present. It reaches a number of phosphate fields. The road is to be completed as far as located by Aug. 15.

A concession has been granted to Octavio Maldonado for a narrow-gauge road to extend from the Teapa River in the State of Tabasco, passing through the town of Ixtapangajoga in Chiapas to Solosuchiapa in the same State. A branch may also be constructed from the right bank of the Teapa River to the city of Teapa. Surveys must begin immediately and construction commence within a year, at least ten kilometers being completed yearly. The principal office will be in San Juan Bautista, State of Tabasco. Fifteen years' exemption from customs duties on construction and operating material is given, but no subvention.

A road is proposed from Eagle Lake, Tex., to the mouth of the Brazos River.

J. R. de Remer expects to begin grading shortly on the proposed road from near Trinidad to La Junta, Col. The Chamber of Commerce of Trinidad has secured the right of way and accepted the other conditions proposed by Mr. De Remer when he agreed to build the branch. The road will be a continuation of a coal branch of the Union Pacific from Thompson's mines, about 12 miles from Trinidad, to La Junta, on the South Fork of the Las Animas River, a distance of about 20 miles. It is understood that it is the intention to build beyond that point across part of the Maxwell Land Grant.

**Ontario & Rainy River.**—This company, which is now seeking a charter from the Dominion Parliament, was first incorporated by the Ontario Legislature to build a road from Fort William, Ont., near Port Arthur, to a point on Rainy River at Fort Francis near the mouth of the river, with a branch to Rat Portage. Running powers were granted over the Port Arthur, Duluth & Western. Part of the route was surveyed last spring.

**Pennsylvania.**—A survey has been recently made for a short extension of the Chestnut Hill branch near Philadelphia, from the Chestnut Hill station northwest to Flourtown or White Marsh, to connect with the new Trenton branch at the latter point. The survey may be continued along the Wissahickon Creek to Ambler. It is expected that the line will be built to White Marsh at an early date. The line is to allow local passenger trains on the Trenton branch to reach the Broad Street Station in Philadelphia without making the long detour by way of Norristown.

**Philadelphia & Reading.**—A new survey is being made for the proposed line from Chestnut Hill, near Summit street, Philadelphia, to Glenside, Pa., which will form a connection with the North Pennsylvania and Chestnut Hill branches. The object is to make some change in the route at the Chestnut Hill end. The charter has been granted by the State under the name of the Chestnut Hill & Jenkintown, and it is believed the road will be speedily built.

**Portland & Rochester.**—The new branch track, which has been recently constructed between Green street and Portland street, at Portland, Me., and which forms a connecting line between the Union station and the Portland & Rochester station, at the foot of Preble street, was opened for traffic June 29, and will be known as the Union Branch.

**Rio Grande Western.**—The Springville Grading Co. has the contract for grading the first section of the Tintic branch of this road from Springville, Utah. Grading has begun on the main line between Provo and Spanish Forks. Reynolds Bros., of Springville, have the contract for grading between Goshen and Eureka, Utah. The branch will be about 65 miles long and will be in operation in September.

The Sevier Valley extension was completed to Salina, Utah, 26 miles south of Manti, last week, and regular trains are now running over the branch to Sevier. The track laid last year from Thistle, on the main line, south to Manti, 60 miles, was narrow gauge, but it has been decided to widen the entire line to standard gauge. The work will probably be completed July 15. Standard gauge ties were put in when the extension was built, so that the only work to be done is to relay the rails.

**Savannah, Americus & Montgomery.**—The grading on the Montgomery extension has been completed to the corporate limits of that town. The track has been laid to a point near Mt. Meigs, within 10 miles of Montgomery, and will probably be finished to the city this or next week. The route for the entrance to Montgomery and through the city streets has not yet been made public. Besides the track to be laid at the Montgomery end, 10 miles west of Hartsboro, Ala., between that point and the Chattahoochee River, remains to be completed. The line will probably be ready for traffic on the entire 95 miles by August.

**Skowhegan & Norridgewock.**—The town of Skowhegan, Me., at an election held on June 29, voted \$15,000 to aid the building of this road from Skowhegan to Norridgewock, Me., a distance of nine miles. It is expected that the directors will soon come to an arrangement with the Maine Central by which that road will complete the new line and operate it. The company has proposed to guarantee \$75,000 of the four per cent. bonds of the road.

**Tennessee River & Sequachee.**—John M. Blackburn is making a survey for this road from the Tennessee River to Sequachee, a distance of four miles, thence up

Indian Cove four miles to the top of Cumberland Mountain. The company has been chartered by L. N. Farley, W. D. Spears, G. Sherman, H. K. Pevey and T. H. Hill.

**Texas Western.**—It is reported that arrangements have been made for the building of the road from Sealey, Tex., to a point 15 miles east.

**The Dalles, Dufur & Silkstone.**—The company has been incorporated in Oregon to build a road from The Dalles to coal mines at Fossil, Or. The capital stock of \$100,000 has been all subscribed. Work is to begin shortly. The incorporators are George W. Young, of Newberg, Or.; Henry Bond, of England; George A. Liebe, E. B. Dufur, T. A. Hudson, T. H. Johnston, R. H. Norton, of The Dalles, Or.

**Toronto, Hamilton & Buffalo.**—The promoters of this road are meeting with much opposition in their effort to secure the passage of their bill for the incorporation of this company, now before the Dominion parliament. The bill provides for the construction of a road from a point in the city of Toronto to a point in Hamilton, Ont., and thence to the Niagara River, with special powers to condemn crown and private lands for the purposes of the company. The road is incorporated under a provincial charter in Ontario. It is asserted that the projectors are unable to arrange for the building of the road if it is incorporated, and that they desire the Dominion charter to increase the speculative value of the line.

**Wilkesbarre & Western.**—The branch of this road from near the main line, near Rohrsburg, has been completed south toward the Susquehanna River, as far as Orangeville, Columbia County, Pa., where connection is made with the Bloomsburg & Sullivan road.

**Wilmington, Chadbourne & Conway.**—The engineers have been engaged on the locating survey from Chadbourne, N. C., for the last month and a half, and have now decided upon the route north to the Pee Dee River and through the swamp. The grading was begun last week, the contract for the first section having been let to Horace Butters. The extension will be about 25 miles long, and is to be built to Lumberton, S. C., on the Carolina Central.

**Winnipeg & Hudson's Bay.**—Considerable opposition is developing to the bill now before the Dominion parliament granting an increased subsidy to this corporation. The bill provides that the government enter into a contract with the company for the transport of men, supplies, materials and mails for 20 years, and to pay for those services \$80,000 per annum, from the date of the completion of that road.

#### GENERAL RAILROAD NEWS.

**Baltimore & Lehigh.**—The consolidation of the Deer Creek & Susquehanna road with the Maryland Central and the York & Peach Bottom railroads, under the above name, has been finally effected. The Deer Creek & Susquehanna company last week voted to issue 40,500 shares of stock and \$2,500,000 of bonds. The stock of the company is to be turned over to the Baltimore Forwarding Co., which is to complete the construction of the road between Belair and the Susquehanna River, the railroad to turn over to the construction company 40,500 shares of stock and \$2,200,000 50-year five per cent. gold bonds. The capital stock of the consolidated company is \$6,000,000, and it is authorized to issue \$2,500,000 of five per cent. bonds, to be designated as the Susquehanna Division bonds. Work on the Susquehanna Division is to be resumed within three months.

**Baltimore & Ohio.**—The company has begun relaying its Philadelphia line with steel rails weighing 85 lbs. to the yard. This work will proceed gradually, with the intention of having the entire double track between Canton and Philadelphia relaid with the heavy steel rails by the close of 1892. The block system is used on all but 26 miles of the route. The blocks are each five miles long.

**Boston & Maine.**—The directors of the company have voted to issue \$5,500,000 additional stock in order to dispose of the floating indebtedness and to provide for further improvements. This will give stockholders \$27 per share on their present holdings at the quoted market price, which was 185 this week.

**Chicago, Burlington & Quincy.**—The following statement gives the earnings and expenses for May and the first five months of the fiscal year:

Month of May:	1891.	1890.	Inc. or Dec.
Gross earnings.....	\$2,618,707	\$2,286,721	D. \$338,084
Operating expenses.....	1,934,468	1,966,907	D. 373,498
Net earnings.....	\$1,025,239	\$1,019,824	I. \$5,414
Fixed charges.....	792,000	773,515	I. 18,484
Surplus.....	\$233,239	\$246,309	D. \$13,070

For five months:

Gross earnings.....	\$12,160,388	\$14,196,441	D. 2,036,053
Operating expenses.....	8,091,850	9,347,746	D. 1,255,896
Net earnings.....	\$4,068,538	\$4,848,695	D. \$780,157
Fixed charges.....	3,960,000	3,867,577	I. 92,422
Surplus.....	\$108,538	\$981,118	D. \$872,579

**Chicago, Milwaukee & St. Paul.**—The earnings for May, 1891, and the 11 months to May 31, as compared with the corresponding periods last year, were as follows:

Month of May:	1891.	1890.	Inc. or Dec.
Gross earnings.....	\$2,097,547	\$2,000,254	I. \$97,293
Oper. exp., inc. taxes.....	1,545,083	1,505,721	I. 39,372
Net earnings.....	\$552,463	\$494,532	I. \$57,921

Eleven months to May 31:

Gross earnings.....	\$25,356,609	\$24,455,831	I. \$900,778
Oper. exp., inc. taxes.....	16,893,502	15,863,024	I. 1,030,478
Net earnings.....	\$8,463,107	\$8,592,807	D. \$129,700

**Chicago & Northern Pacific.**—The Chicago City Council has repealed an ordinance which had been passed through the Council 10 days ago, by which the company was granted many miles right of way within the city limits, and conferring other privileges of great value. It is said that the repeal of the ordinance is nullified in consequence of its having already been confirmed by the city authorities.

**Cincinnati Southern.**—The Cincinnati Chamber of Commerce last week, by a practically unanimous vote, adopted a report of a committee favoring a perpetual lease of the railroad, with a provision making discrimination against Cincinnati in rates impossible. The present lessees decline to make any extensive improvements unless they can be assured of a longer control of the line



than the present lease. They have proposed that the city of Cincinnati, which owns the road, sell the property absolutely.

**Delaware, Lackawanna & Western.**—The directors of this company, which is the lessee of the Morris & Essex road, have arranged for meeting the second mortgage bonds of the line, falling due on Aug. 1 next, when they will be paid in cash. The maturing bonds bear seven per cent. interest and amount to \$3,000,000. The bondholders have the privilege of extending their holdings for new consolidated four per cent. mortgage bonds.

**Hudson Tunnel.**—A special meeting of stockholders was held in New York, June 29, at which a new consolidated mortgage for \$25,000,000 was authorized. The old bonds will be refunded by bonds issued under the new mortgage, which is also to provide the necessary money to complete the tunnel and to provide for the approaches and terminals on both sides of the river. About 1,600 ft. of the tunnel on the New York side of remains to be completed.

**International & Great Northern.**—The Supreme Court of Texas has decided that the Attorney-General of the state had no right to interfere with the foreclosure suit of the Farmers' Loan & Trust Co., of New York. The Attorney-General brought suit against the trust company on the ground that the consent of the bondholders of the railroad to the making of the first and second mortgages had never been obtained and filed in the Secretary of State's office. It has transpired that the documents were filed, but not indorsed. This the Attorney-General urged that under the laws of Texas bonds cannot be issued except for work done on the railroad, and that the amount of bonds in question far exceeded the value of any work done on the road. He insisted that inasmuch as it has been held that the Railroad Commissioners appointed by the state could not reduce the rates so low as not to admit of payment of interest on bonds the state had therefore an interest in having the amount of bonds cut down as low as possible. The court believed that the question should come up only when the Railroad Commissioners undertake to reduce the rates of the road.

**Louisville & Nashville.**—The gross earnings for May were \$1,406,504, a decrease of \$80,712 as compared with the same month of last year; and net earnings were \$491,973, a decrease of \$82,631. For the eleven months ending May 31 the gross earnings were \$17,710,262, an increase of \$349,532 as compared with the corresponding period of last year, and net earnings \$6,499,908, an increase of \$370,935.

**Nashville, Chattanooga & St. Louis.**—At a special meeting of the stockholders at Nashville, Tenn., June 30, an increase of the stock amounting to \$3,331,387 was authorized. The par value of the shares is \$100, and the stock will be offered to present stockholders at 50, in the proportion of one-half of their present holdings.

**New York Central & Hudson River.**—The earnings and expenses of the system for the quarter and year ending June 30, 1891, were as follows:

Quarter to June 30:	1891.	1890.	Inc. or dec.
Gross earnings.....	\$10,765,447	\$9,154,170	I. \$1,611,277
Oper. expenses.....	6,753,861	6,181,441	I. 572,420
Net earnings.....	\$3,511,586	\$2,972,729	I. \$538,857
Fixed charges.....	2,478,206	1,944,621	I. 533,585
Dividend.....	894,283	894,283	.....
Surplus.....	\$138,093	\$137,755	I. \$338
Year ending June 30:	1891.	1890.	Inc. or dec.
Gross earnings.....	\$37,780,313	\$37,008,404	I. \$771,909
Oper. expenses.....	25,252,807	24,192,131	I. 1,060,676
Net earnings.....	\$12,527,506	\$12,816,273	I. \$11,432
Fixed charges.....	8,800,456	7,853,811	I. 1,006,645
Dividend.....	3,577,132	4,024,273	D. 447,141
Surplus.....	\$89,918	\$638,189	D. \$548,271

The earnings of the Rome, Watertown & Ogdensburg are included after March 14, 1891.

**New York, Lake Erie & Western.**—The double-tracking of the Northern Railroad of New Jersey was completed last week between Cresskill and Sparkill, N. J., seven miles. The road between Sparkill and Jersey City, 25 miles, will be operated as a double-track line next month.

The following table shows the earnings of the company for May, 1891, and for the eight months, Oct. 1 to May 31, as compared with the corresponding periods of the last fiscal year:

Month of May.	1891.	1890.	Inc. or Dec.
Gross earnings.....	\$2,149,433	\$2,107,070	D. \$42,363
Oper. expenses.....	1,573,282	1,618,469	D. 45,187.24
Net earnings.....	\$876,151	\$878,601	D. \$2,447.83
Less proportions due to leased lines.....	196,614	220,281	D. 24,207.17
Net earnings.....	\$679,540	\$657,780	I. \$21,760.34
Oct. 1 to May 31.	1891.	1890.	Inc. or Dec.
Gross earnings.....	\$18,806,228	\$18,769,621	I. \$36,607
Oper. expenses.....	12,553,361	12,369,324	I. 194,037
Net earnings.....	\$6,252,867	\$6,410,297	D. \$157,430
Less proportions due to leased lines.....	1,656,002	\$1,704,676	D. 48,675
Net earnings.....	\$4,596,865	\$4,705,621	D. \$108,756

**Philadelphia & Reading.**—The following are the earnings of the railroad company for May in 1891 and 1890, and for the year to date:

Month of May.	1891.	1890.	Inc. or dec.
Gross receipts.....	\$1,779,222	\$1,728,335	I. \$50,886
Gross expenses.....	985,590	1,037,210	D. 51,619
Profit in operating.....	\$793,631	\$691,125	I. \$102,506
Other receipts.....	14,483	38,058	D. 23,575
Profit for month.....	\$808,114	\$729,183	I. \$78,930
Expend. for perm. improv.	20,854	39,535	D. 18,681
One-twelfth of year's fixed charges.....	614,569	598,504	I. 16,065
Surplus.....	\$172,589	\$91,143	I. \$81,546
Year to May 31.	1891.	1890.	Inc. or dec.
Gross receipts.....	\$9,810,066	\$9,449,382	I. \$360,684
Gross expenses.....	5,726,496	5,897,415	D. 80,919
Profit in operating.....	\$4,083,569	\$3,611,966	I. \$471,603
Other receipts.....	\$205,513	\$205,204	I. \$308
Profit for month.....	\$4,289,082	\$3,817,171	I. \$471,911
Expend. for perm. improv.	\$263,978	\$399,998	D. \$136,020
One-twelfth of year's fixed charges.....	3,695,838	3,501,027	I. 194,810
Surplus.....	\$329,265	\$143,855	I. \$185,410

**St. Louis & San Francisco.**—The new consolidated mortgage recently authorized at the special meeting of stockholders in St. Louis was filed in the office of the Recorder of Deeds in St. Louis, June 27. The mortgage is in favor of the Metropolitan Trust Co., of New York City, and is to secure the 100-year four per cent. bonds which are to be issued to the amount of \$50,000,000.

**St. Paul, Stillwater & Taylor Falls.**—Judge Cornish at St. Paul, June 28, ordered the sale of this to satisfy a judgment of \$216,000, held by Russell Sage, of New York. Charles B. Brunson, of St. Paul, was appointed Receiver.

## TRAFFIC.

### Chicago Traffic Matters.

CHICAGO, July 1, 1891.

Chairman Finley has refused to pass upon the application of the Chicago & Alton for authority to establish rates of \$5.75 from Chicago to East St. Louis, and \$5 Chicago to St. Louis and a rate not higher than \$10 Chicago to Kansas City and not higher than \$25 Chicago to Denver, on the ground that the Alton, having failed to comply with the agreement or pay the fine imposed, has therefore abandoned its obligations under the agreement and is not entitled to have any of its applications considered. In his decision Mr. Finley calls attention to the fact that the Chairman, by the terms of the agreement, has the authority to construe its articles, rules and regulations, and his decisions shall be binding upon each member until reversed by a two-thirds vote of the Association or by arbitration; that in the event of any contravention of any requirement of the agreement penalties are provided and members are under vital obligation to pay such penalties. The Alton, replying, complains that the ruling might have been promulgated earlier, thus tacitly admitting the right of the Chairman to make the ruling. Mr. Charlton says he has notified the Interstate Commerce Commission that he will put in effect June 29 reduced rates as follows: Chicago to St. Louis \$6, Chicago and Kansas City each way \$10. He holds that these rates are rendered necessary by mileage tickets and excursion tickets being made good practically to bearer on competing lines and by the issuance of one-way tickets from territory in which the Alton is "boycotted," and which are sold "for the express purpose of being scalped" over the lines of the Alton's competitors. In conclusion he threatens to cut the rates from St. Louis to Chicago and from Chicago to Denver, if deemed necessary for protection. The other lines interested in the Kansas City and St. Louis business were given authority to meet the rates of the Alton, and the rates will be generally effective to-day, also to and from Chicago, Atchison, Leavenworth and St. Joseph, Mo. There are at present no indications that the rates will be further reduced or that the reductions will extend beyond these points. Commissioner Smith, of the Western Traffic Association, to whom the Board of Commissioners referred the question of a division of the salt shipments from Hutchinson, Kan., has just ordered the Atchison to divert to the Rock Island 300 tons for the purpose of equalizing the tonnage.

The statements sent out that the Burlington had resumed the payment of commissions on passenger business in the Trunk Line and Central Traffic Association territory are only partially true. That road has resumed the payment of commissions only on a few roads which have themselves recommended the practice.

The Iowa Central has been given authority to apply a rate of 45 cents per net ton lower than the tariff rate from Chicago on shipments of coal direct from the Pennsylvania mines to points west of the Mississippi River, effective July 1.

Rates on iron ore from the mines in Michigan to ports on the lakes are in an unsettled condition, the roads in interest being unable to agree upon a scale of rates to prevail. The Chicago & Northwestern referred the matter to the Board of Commissioners of the Western Traffic Association for determination, requesting authority to make a new basis of rates which should be retroactive to the commencement of the present season, and also to be relieved from association rules in competition with the Duluth, South Shore & Atlantic, not a member. The latter divides the output of the Marquette range with the former, the Northwestern delivering at Escanaba, and the South Shore at Marquette. The latter claims a 25-cent differential for Marquette, while the former is not willing to concede more than 15 cents. The other lines want the rates of last season maintained, some of them having given assurances to shippers that they will prevail. The shippers, on the other hand, want the rates generally reduced. The Commissioners decided that prevailing market conditions and prices do not warrant a reduction. In this connection they say:

The lake rates to Chicago and Milwaukee are low at the present time and unsettled, but the condition of Lake transportation this year is extraordinary, and it cannot be considered wise for rail carriers to attempt to meet the fluctuation of Lake rates during such a season as this, especially upon tariffs which are in effect all the year round, and on which there is a considerable movement during the winter months. The present conditions of the iron industry, in a measure at least, are temporary, in part attributable to the strike in the coke regions, which caused many furnaces to go out of blast, and in part to a variety of other causes, among which may be mentioned the financial difficulties of last fall. Under such circumstances shippers are very apt to appeal to the carriers for assistance, but so long as the roads maintain a low tariff through years of prosperity it is not unjust for them to keep the same scale in effect during a period of depression. It is possible that some general readjustment, involving further concessions, will be required if the existing conditions are continued, especially if the output of the Southern States is further developed; but it does not seem to the board that enough has yet been shown to warrant them in ordering a reduction in face of the strong opposition; it is thought that it would be more judicious to regard present conditions as unsettled and experimental, and to hold the matter open for further consideration at a future time, if desired.

In considering the request of the Northwestern for relief the Commissioners say, in substance:

This position is one which the Commissioners cannot criticize. It is the object of the Association to promote equality of rates, and, so far as possible, to secure a fair distribution of traffic; and when a member finds itself required to take measures for self-protection as against an outside line the obligations of the agreement should ordinarily be relaxed by the Commissioners for that purpose, unless an unwarrantable injury to other members is necessarily involved. . . . It would be wrenching the Association from its fundamental objects to refuse to permit a member to meet the competition of outside lines on equal terms, unless such permission involves a sacrifice on the part of other members. . . . The placing of the Chicago & Northwestern upon a parity with the Duluth, South Shore & Atlantic in this matter will probably enable those lines to settle their differences between themselves. The circumstances of the present case are not such as to entitle the other lines to stand in the way of the Chicago & Northwestern in obtaining

a fair distribution of a competitive traffic between itself and an outside line. . . . The Chicago & Northwestern may therefore properly insist upon a reduction of the differential to 20 cents, and it is authorized to reduce its rates if found necessary.

The roads have had several conferences, but so far as known have been unable to arrive at any settlement of the questions.

Messrs. W. H. Newman, Vice-President of the Chicago & Northwestern; E. P. Ripley, Vice-President of the Chicago, Milwaukee & St. Paul, and P. S. Eustus, General Passenger and Ticket Agent of the Chicago, Burlington & Quincy, sitting as a board of arbitration to decide the appeal of the Illinois Central from Chairman Finley's fines for the refusal of that road to advance passenger rates from St. Louis to Chicago on May 17, have decided that the Illinois Central need not pay the fines. This decision is based on the fact that the Chicago & Alton had kept rates down so effectively that an advance would have been unreasonable, though technically the Illinois Central was liable to the fine.

At a meeting of the traffic managers of the eastbound roads on Monday, the Michigan Central announced that, taking effect July 4, it would reduce the rate on dressed beef from 46½ to 45 cents per 100 lbs., Chicago to Boston, thereby making it the same as the rate to New York. This reduction is demanded by shippers, because on live stock the same rate applies to both New York and Boston. On Tuesday Chairman Blanchard authorized all roads to make a corresponding reduction. The Chicago & Grand Trunk will at once reduce the Boston rate to 43½ cents.

The Atchison, Topeka & Santa Fe has appealed to the Advisory Board of the Western Traffic Association from the decision of the Commissioners ordering it to discontinue the differential freight tariff recently put in effect from the Atlantic seaboard to Kansas points via Galveston, and asks that the tariff be allowed to remain in force pending a hearing by the Advisory Board.

The Chicago, St. Paul & Kansas City has addressed a communication to the committee in charge of the distribution of passenger traffic on the northwestern roads, demanding that the sum of \$4,000 be charged up against the Chicago & Northwestern road for a violation of the agreement. The alleged breach of contract consisted in carrying 200 passengers to a St. Paul convention after the board had routed the business exclusively over the Chicago, St. Paul & Kansas City.

### Traffic Notes.

The Gulf, Colorado & Santa Fe has issued a notice, in consequence of the new Texas law regulating railroad rates, abolishing a large number of special rates.

The Railroad Commissioners of Texas have issued a circular to express companies notifying them that on July 13 they will begin the work of classifying express freight and fixing tariffs for the same.

Iron manufacturers and others in the territory of the Mahoning & Shenango Valley Car Service Association have resisted the payment of demurrage bills to such an extent that there are now a large number of unpaid bills on hand, and the Association has notified consignees that suits at law will be begun July 6.

The owners of nearly all the floating grain elevators in New York Harbor have formed a corporation entitled the International Grain Elevator Co., with a capital stock of \$1,600,000. The officers of the company are Edward G. Burgess, President; Edward Annan, Vice-President, and John McCue, Secretary. They are all members of the firm of Annan & Co. The Treasurer is George D. Puffer, who has been owner of rival elevators. Annan & Co. put into the concern 19 elevators, Mr. Puffer five and Milton Knapp two. It is said that ever since the rate of five-eighths of a cent a bushel was established by law the elevators have been losing money. The incorporators believe that by joining hands they can stop the leaks and expenses incident to business rivalry and earn a decent income on the capital invested.

The Interstate Commerce Commission, on June 29, in an opinion by Commissioner Morrison, decided the case of the James & Mayer Buggy Company against the Cincinnati, New Orleans & Texas Pacific, the Western & Atlantic and the Georgia railroads in favor of complainant. Carriers may accept the same rates for longer and shorter distances, provided they do not subject any particular person or locality, or any particular description of traffic, to unreasonable disadvantage. Goods shipped from Cincinnati to points in Georgia are interstate traffic, and all the roads forming a part of the line over which such goods are carried to destination are engaged in interstate commerce, and subject to the act to regulate commerce. Neither the roads together nor any one of them can evade the fourth section of that statute by declaring that as to traffic destined to certain stations on the terminal road it is a local carrier. The carriers will be ordered to cease and desist on and after July 20, 1891, from making any greater charge in the aggregate on buggies, carriages and other first-class freight in less than carloads from Cincinnati to Social Circle than to Augusta, and from making any charge on such freight from Cincinnati to Atlanta in excess of \$1 per 100 lbs.

### East-Bound Shipments.

The shipments of east-bound freight from Chicago by all the lines for the week ending June 25 amounted to 43,628 tons, against 39,447 tons during the preceding week, an increase of 4,181 tons. The proportions carried by each road were:

	Wk. to June 25		Wk. to June 18	
	Tons.	P. c.	Tons.	P. c.
Michigan Central.....	4,556	10.5	4,087	10.4
Wabash.....	2,507	5.8	2,319	5.9
Lake Shore & Michigan South.	6,236	14.3	6,241	15.8
Pitts., Ft. Wayne & Chicago..	5,194	11.9	5,127	13.0
Pitts., Cin., Chicago & St. L. .	5,468	12.5	5,070	12.8
Baltimore & Ohio.....	3,415	7.8	3,319	8.5
Chicago & Grand Trunk.....	3,301	7.6	3,325	8.4
New York, Chic. & St. Louis..	4,337	9.9	3,685	9.4
Chicago & Erie.....	8,604	19.7	6,214	15.8
Total.....	43,628	100.0	39,447	100.0

Of the above shipments, 2,044 tons were flour, 11,880 tons grain, 1,743 tons millstuff, 4,551 tons cured meats, 8,211 tons dressed beef, 1,131 tons hides and 7,336 tons lumber. The three Vanderbilt lines together carried 34.7 per cent., while the two Pennsylvania lines carried but 24.4.